

Savannah River Site Annual Meteorology Report for 2006 (U)

Washington Savannah River Company
Savannah River Site
Aiken, SC 29808

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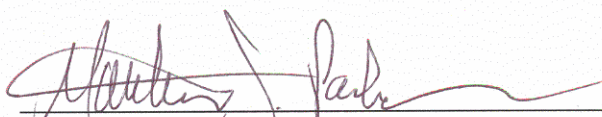
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Overview

Summaries of meteorological observations collected at the Savannah River Site in 2006 depict a year that overall was cooler and much drier than average. Annual rainfall for 2006 was 10.29 inches less than the most recent 30-year average, which ranks as the fourth driest year since 1952. March's total rainfall of 1.76 inches was the fifth lowest in the 54 years of record; conversely, the monthly rainfall in June, 6.89 inches, was the ninth highest on record. The largest daily rainfall of 3.30 inches was due to the remnants of Tropical Storm Alberto moving over the SRS on June 14. Rainfall of 0.01 inches or more occurred on 93 days during the year.

The annual average temperature for 2006, 63.8°F, was the 12th *coldest* of any year in a record that dates to 1968. Conditions were cooler than average in 8 of the 12 months of the year. Below average temperatures were particularly prevalent during the late summer and fall. October's average temperature of 62.4°F was the sixth coldest on record. The coldest temperature of the year was 18.4°F on the morning of December 9; the warmest temperature was 99.9°F on the afternoon of July 15.

Several significant wind events occurred during the winter and early spring of the year. The highest measured ground-level wind speed (gust), 43.4 miles per hour (mph), was associated with a strong thunderstorm complex moving over SRS during the day on May 19th. A tight pressure gradient from a strong low pressure area over the Northeast U.S. produced the highest daily average wind speed of 21.7 mph on January 14.

The most notable weather 'events' of 2006 were the formation of a weak El Niño in the late summer, lasting through the end of the year, and the below normal hurricane season. After beginning the year under a weak La Niña, July was accompanied by weak El Niño conditions, which increased to a moderate El Niño by years end. The effects of El Niño were felt during the 2006 tropical season. After a record setting 2005 season, 2006 saw only five hurricanes and four tropical storms, with only two tropical storms (Alberto and Ernesto) making landfall in the U.S (NOAA 2006e).

Background

The General SRS Climate

The Savannah River Site region has a humid subtropical climate characterized by relatively short, mild winters and long, warm, and humid summers (Oliver and Fairbridge, 1987).

Summer-like conditions typically last from May through September, when the area is frequently under the influence of a western extension in the semi-permanent Atlantic subtropical anticyclone (i.e. the 'Bermuda' high). Winds in summer are light and cold fronts generally remain well north of the area. Daily high temperatures during the summer months exceed 90°F on more than half of all days on the average. Scattered afternoon and evening thunderstorms are common.

The influence of the Bermuda high begins to diminish during the fall as continental air masses become more prevalent, resulting in lower humidity and more moderate temperatures. Average rainfall during the fall is usually the least of the four seasons.

In the winter months, mid-latitude low pressure systems and associated fronts often migrate through the region. As a result, conditions frequently alternate between warm, moist, subtropical air from the Gulf of Mexico region and cool, dry polar air. The Appalachian Mountains to the north and northwest of the SRS help to moderate the extremely cold temperatures that are associated with occasional outbreaks of Arctic air. Consequently, less than one-third of winter days have minimum temperatures below freezing on average, and days with temperatures below 20°F are infrequent. Measurable snowfall

occurs an average of once every 2 years.

Tornadoes occur more frequently in spring than the other seasons of the year. Although spring weather is somewhat windy, temperatures are usually mild and humidity is relatively low.

Overview of the Savannah River Site Meteorological Monitoring Program

Meteorological data are collected at SRS from a network of nine primary monitoring stations (Fig. 1). Towers located adjacent to each of eight operations areas (A, C, D, F, H, K, L, and P areas) are equipped to measure wind direction, wind speed, temperature, and dew point at a height of 61 meters (m) above ground. Temperature and dew point are also measured at 2m. A ninth tower near N-Area, known as the Central Climatology site (CLM), is instrumented with wind, temperature, and dew point sensors at four levels: 2m (4m for wind), 18m, 36m, and 61m. The CLM site is also equipped with an automated tipping bucket rain gauge, a barometric pressure sensor, and a solar radiometer near the tower at ground level. Data acquisition units at each station record a measurement from each instrument at 1-second intervals. Every 15 minutes, 900 data points are processed to generate statistical summaries for each variable, including averages and instantaneous maxima, and the results are uploaded to a relational database for permanent archival. All aspects of the meteorological data collection program meet or exceed applicable regulatory criteria. Parker and Addis (1993) provide a complete description of the meteorological monitoring program at SRS.

Quality assurance of the data is conducted in two phases: an initial screening of recent data, followed by an in-depth review and

final quality classification. The initial screening, performed twice daily by qualified instrument technicians, consists of a thorough examination of 15-minute data retrieved from the database, in conjunction with a summary of instrument diagnostics obtained from the local data acquisition units. Potential problems are noted in a daily checksheet and, as needed, data acquisition unit software is configured to assign a quality control tag to data collected from the questionable instruments. Quality flags are also set during periods of calibration and maintenance.

The second phase of the quality assurance process is conducted according to formal procedure (SRNL, 2004). Daily checksheets generated during the initial screening, tower-specific logbook entries, initial quality flags, and time series plots of related data are reviewed to determine a final quality status for each record. All records permanently archived in the data base are identified as good, fatal, intermittent, biased, or uncalibrated.

Tall Tower Monitoring System

ATG's Tall Tower facility near Beech Island, SC provides a set of high-quality meteorological measurements that is unique to the southeast U.S. This facility utilizes fast-response sonic anemometers, water vapor sensors, and barometric pressure sensors, and slow-response temperature sensors and relative humidity sensors. Data are collected at 30m, 61m, and 304m above ground level. Spread-spectrum modems at each measurement level transmit raw data to a redundant set of PCs at the Savannah River National Laboratory (SRNL). Data processing software on the PCs determine mean values and other statistical quantities every 15 minutes and uploads the results to the relational database.

Additional Measurements

Additional precipitation measurements are collected from a network of 12 plastic wedge rain gauges across the SRS (See Fig. 1). These gauges are read manually by security or operations personnel once per day, usually around 6 am. The daily data are reported to the SRNL Atmospheric Technologies Center, reviewed to correct obvious flaws, and manually entered into a permanent electronic data base.

Additional measurements of temperature and relative humidity are recorded from a weather station located in A-Area, adjacent to SRNL. This station consists of a standard National Weather Service 'cotton region' instrument shelter. Data collected from this station are manually tabulated for archival as daily high and low values of temperature and relative humidity. Tabulated values are then entered into a permanent electronic data base.

Data Sources for the 2006 Report

Summaries provided with this report are based on the following sources of data:

- Ground level (surface) measurements of *temperature (2m)*, *dew point temperature (2m)*, *wind speed (4m)*, *precipitation*, *barometric pressure*, and *solar radiation* from CLM, as well as meteorological quantities derived from these primary data, such as *relative humidity* (temperature and dew point), *wet bulb temperature* (temperature and dew point), *wet bulb globe temperature* (temperature, dew point, wind speed, and solar radiation), and *cooling/heating degree days* (temperature).

- Wind speed and direction from measurements collected at each of the four levels of the CLM tower and the 61m level of the eight area towers.
- Precipitation from the network of manually-read rain gauges

A series of SAS System® software routines were used to extract the desired data sets from the data base and perform initial statistical processing on all records with a QA status of 'good'. More than 99% of the data used in this report met this QA classification in 2006.

Output from the initial processing was then imported into an Excel® spreadsheet to generate the final summaries that are presented in the report.

Long-term climatological records are available for temperature, precipitation, and relative humidity. Statistics generated from these data are used for comparisons with the 2006 summaries.

Available records of SRS temperature and relative humidity begin in 1968. From 1968 through 1995, the climatological statistics used in this report are based on the daily maxima and minima recorded at the SRNL instrument shelter. After 1995, these statistics are based on measurements from the 2m level of CLM.

Precipitation data are available from 1952. For the period 1952 through 1995, statistics presented in the report are based on daily observations from the SRNL rain gauge. Summaries after 1995 are based on data collected from the CLM rain gauge.

Climatology of the SRS for 2006

Highlights

Meteorological data summaries for 2006 depict a year that was cooler and much drier than long-term averages. The annual average temperature of 63.8°F was the 12th coldest of any year in the available record. Relatively cool weather was particularly prevalent during the late summer and fall months. Annual rainfall for 2006 was 10.29 inches less than the most recent 30-year average, which made it the fourth driest year on record. Rainfall was well above average in June and December; conversely, March 2006 was the fifth driest of any March on record. A summary plot of daily observations of temperature, precipitation, relative humidity, and wind speed is given in Figure 2.

Seasonal climatological discussions published by the National Weather Service, Climate Prediction Center (CPC), and the National Centers for Environmental Prediction (NCEP)(NOAA 2006b, 2006c, 2006d, and 2006e), suggest that the relatively warm weather observed during January was the result of anomalous mid-level heights (heights higher than normal) over eastern Canada. This resulted in zonal (westerly) mid-level flow across much of North America, and near-record warmth over much of the United States. These conditions were consistent with those expected during weak La Niña periods. By April, the La Niña faded to a near neutral ENSO (El Niño/Southern Oscillation), which resulted in a shift of the persistent surface high pressure from eastern Canada to the central United States. This resulting shift produced below-normal precipitation from the Southwest U.S., through the Gulf Coast, and reaching into the mid-Atlantic states.

During June, an area of high pressure began to build over the western United States. As a result, a trough developed over the eastern U.S. causing a shift in the storm track, and leading to above-normal rainfall at SRS. An El Niño began to develop toward the end of summer, creating conditions at SRS of near normal or below-normal temperatures from September through November, and near or above-normal rainfall in November and December.

Temperature

Monthly average, annual average and daily extreme temperatures for 2006 are summarized in Table 1(a). Similar statistics for a 30-year climatological reference period (1976-2005) are given in Table 2. A plot of observed daily high and low temperatures for 2006 is shown in Fig. 3. Plots of annual average temperature, monthly average daily high and low temperature, and days exceeding significant temperature thresholds (<32°F, >90°F) for 2006 and the 30-year reference period are shown in Figures 4, 5, and 6, respectively.

The annual average temperature for 2006, 63.8°F, was 0.6 degrees below the 30-year climatological average. Monthly average temperatures were below climatological averages for all months of the year except January, April, August, and December. Furthermore, average temperatures for May, June, September, October, and November ranked among the ten coldest on record for those months. Temperatures above 90°F were observed on 63 days during the year and around 70% of total days in July and August. Temperature extremes ranged from 18.4°F on December 9 to 99.9°F on July 15. Daily low temperature records were set on March 25

and 26, May 2 and 13, June 7, July 9, and December 9. A daily high temperature record was set on June 11.

Monthly and annual total heating and cooling degree days (based on a reference temperature of 65°F) are summarized in Table 1(c).

The last spring killing freeze (temperature <28°F) date was February 14, with the first fall killing freeze of December 5. March 27 was the last frost date (temperature <32°F) of the spring, and October 24 was the first frost date of the fall.

Precipitation

Annual, monthly, and daily rainfall statistics for 2006 are summarized in Table 1(a). Monthly and annual totals for the previous 30-years (1976-2005) are given in Table 3. Monthly and annual rainfall totals for the 12 manually read gauges across the SRS are summarized in Table 4. A plot of daily totals (midnight to midnight) for the CLM site for 2006 is shown as Figure 7. A comparison of annual and monthly rainfall for 2006 and the 30-year climatological reference period are shown in Figures 8 and 9, respectively.

Total precipitation at the CLM site, 38.28 inches, was 10.29 inches less than the 30-year average, making it the fourth driest year on record. The monthly total of 1.76 inches for March was the fifth lowest on record for the month. Conversely, June's total of 6.89 inches was the ninth highest on record. The heavy rain that occurred on June 14 (3.30 in) was due to the remnants of Tropical Storm Alberto moving slowly through the Southeast.

Measurable precipitation (>0.01 inch) occurred on 93 days and rainfall greater than 0.5 inch occurred on 23 days.

Atmospheric Moisture

Monthly average, annual average, and daily extreme dew point temperature, wet bulb temperature, and relative humidity for 2006 are summarized in Table 1(b). This table also presents monthly and annual averages of the daily maximum and minimum humidity. A plot of daily observed values of maximum and minimum humidity for 2006 is shown in Figure 10. Plots of annual and monthly averages of humidity for 2006 and the 30-year climatological reference period (1976-2005) are shown in Figures 11 and 12, respectively.

Average relative humidity for 2006 was 65 percent (%) with an average daily minimum of 41% and an average daily maximum of 85%. Days with relative humidity of 20% or less occurred in January, February, March, April, May, and December. The lowest relative humidity recorded during the year was 13% on April 5. Average daily minimum relative humidity was less than long-term values for the entire year.

Observed dew point temperatures ranged from a maximum of 79.0°F on August 29 to a minimum of 7.1°F on December 8. Wet bulb temperature ranged from a maximum of 80.9°F on August 4 to a minimum of 17.2°F on December 9.

Heat Stress

Restrictions on outdoor work due to excessive heat are based on values of the wet bulb globe temperature (WBGT) (WSRC, 1995). Hunter and Minyard (2000) provide a description of WBGT and the method used at SRS to calculate WBGT from standard meteorological measurements at CLM.

Monthly and annual maximum WBGT and statistics on heat stress category days for 2006 is summarized in Table 1(b). The highest WBGT for 2006 was 93.9°F on August 4. Heat stress Category 5 (WBGT >90.0°F) occurred on 20 days during the summer period. A total of 150 days reached at least Category 1 (WBGT > 77.0 °F) from March through November.

Wind

Monthly average and extreme wind speed at the CLM 4 meter level for 2006 is summarized in Table 1(c). Daily averaged wind speed for the year is plotted in Figure 13. Figures 14(a) and 14(b) show wind rose plots depicting joint occurrence frequencies of wind speed category by wind direction sector at the 61 meter level of the eight area towers. Figure 15 provides wind rose plots for the 4 levels of measurement at CLM. Seasonal wind rose plots for 2006 for data from the 61m level of CLM are shown in Figure 16. Tables of the joint frequency data used to create the wind rose plots are given in Appendix A.

Monthly average wind speeds were highest in January and March, with monthly averages exceeding 4.5 mph. The highest instantaneous wind speed recorded at the 4m level, 43.4 mph, was associated with a strong thunderstorm complex moving over SRS during the day on May 19th. A tight pressure gradient from a strong low pressure area over the Northeast U.S. produced the highest daily average wind speed of 21.7 mph on January 14. Average wind speeds were generally the lowest during December.

Wind rose plots for the area towers show typical annual patterns for the 61 meter level. This pattern consists of higher frequencies of wind from the northeasterly

sectors and the southwesterly to west sectors. Due to the location of the D area tower in the shallow valley formed by the Savannah River, winds are somewhat more frequently from the southeasterly and northwesterly sectors than for the other area towers. Wind roses for CLM also show typical variations in the frequency patterns by level, with progressively higher frequencies of southeasterly winds and lower frequencies of northeasterly and southwesterly winds nearer the ground. Weber (2003) provides a complete description of the wind climatology at the CLM site.

The seasonal wind roses show that higher frequencies of westerly wind occur in the winter and spring and a much higher frequency of northeasterly wind during the late summer and fall.

Barometric Pressure

Annual and monthly average and extreme barometric pressure is summarized in Table 1(c). Daily average barometric pressure is plotted in Figure 17. The occurrence of lowest daily average and 15-minute minimum barometric pressure, 992.5 and 987.6 mb, respectively, were associated with the passage of a strong low pressure system through the area on November 16. The highest daily average and 15-minute maximum barometric pressure, 1023.6 and 1026.6 mb, respectively, were associated with a strong high pressure system that built over the mid-Atlantic region of the U. S. on January 27.

Solar Radiation

Annual and monthly averages and extremes of daily total solar radiation are summarized in Table 1(c). This table also

provides monthly and annual values of the fraction of observed solar radiation relative to theoretical clear sky maxima. The monthly theoretical values were estimated from tables published by Budyko (1974). Daily total solar radiation for 2006 is plotted in Figure 18. The average daily values ranged from 209 langleys per day (ly/day) in December to 561 ly/day in June. The months of April, May, June,

July, September, October, and November were relatively sunny with observed solar radiation greater than 70% of clear sky maximum. February and December were relatively cloudy with monthly average observed solar radiation only 61% and 63% of the clear sky maximum, respectively. Individual daily extremes ranged from 15 ly on February 11 to 698 ly on June 7.

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Table 1(a) - Means and Extremes of SRS Meteorological Data for 2006

Month	Temperatures (°F)													Precipitation (in)							
	Average					Extremes				Number of Days				Total	Departure from 30yr avg	Rank (1952-2006)	Greatest in 24 Hrs	Date of 24hr max	No. of Days		
	Avg. Daily High	Avg. Daily Low	Month Avg.	Departure from 30yr avg	Rank (1968-2006)	Highest	High Date	Lowest	Low Date	Maximum Above 90 °F	Maximum Above 100 °F	Minimum Below 32 °F	Minimum Below 20 °F						Greater Than 0.01 in.	Greater Than 0.1 in.	Greater Than 0.5 in.
Jan	63.7	41.3	50.8	+5.2	8	74.5	21st	23.3	7th	0	0	7	0	3.38	-0.90	19	1.55	2nd	13	6	2
Feb	58.3	37.7	47.3	-2.5	12	72.6	17th	24.8	13th	0	0	9	0	2.90	-1.31	17	0.90	26th	8	6	2
Mar	67.0	44.0	55.3	-1.6	12	83.8	12th	28.2	26th	0	0	5	0	1.76	-2.94	5	1.40	21st	4	3	1
Apr	79.5	54.1	66.3	+2.1	12	88.7	15th	37.6	5th	0	0	0	0	2.41	-0.73	17	0.68	8th	5	5	2
May	82.2	59.2	70.1	-1.0	8	95.3	27th	45.1	2nd	8	0	0	0	1.83	-1.64	12	0.79	14th	9	5	1
Jun	87.4	66.0	76.1	-2.1	9	96.3	11th	54.0	6th	8	0	0	0	6.89	+1.94	9	3.30	14th	8	7	3
Jul	92.4	69.8	80.3	-1.1	14	99.9	15th	58.9	9th	23	0	0	0	5.22	-0.18	24	2.76	22nd	10	5	2
Aug	91.4	72.1	80.4	+0.3	15	98.9	4th	67.0	13th	21	0	0	0	2.19	-2.59	7	1.27	11th	6	6	1
Sep	83.5	64.3	72.9	-2.2	8	91.4	3rd	48.0	30th	3	0	0	0	2.50	-1.52	13	1.59	13th	8	4	1
Oct	74.5	52.2	62.4	-2.6	6	88.0	5th	31.6	24th	0	0	1	0	1.66	-1.54	21	0.79	22nd	7	2	2
Nov	67.1	43.3	53.6	-2.8	10	79.7	10th	29.6	4th	0	0	1	0	2.98	0.00	18	1.06	16th	8	7	4
Dec	63.6	40.9	50.6	+2.5	10	74.7	19th	18.4	9th	0	0	7	1	4.56	+1.11	11	1.93	22nd	7	4	2
Year	76.0	53.8	63.8	-0.6	12	99.9	15-Jul	18.4	9-Dec	63	0	30	1	38.28	-10.29	4	3.30	14-Jun	93	60	23

 Rank by coolest

 Rank by warmest

 Rank by wettest

 Rank by driest

Table 1(b) - Means and Extremes of SRS Meteorological Data for 2006

Month	Dew Point Temperature (°F)					Wet Bulb Temperature (°F)					Relative Humidity (%)					Wet Bulb Globe Temperature (°F)						
	Average	Highest	High Date	Lowest	Low Date	Average	Highest	High Date	Lowest	Low Date	Avg. Daily Maximum	Avg. Daily Minimum	Monthly	Lowest	Low Date	Highest	High Date	Number of Days				
																		Cat 1 and Above	Cat 2 and Above	Cat 3 and Above	Cat 4 and Above	Cat 5
Jan	40.6	61.9	11th	14.6	26th	46.2	64.9	21st	21.9	7th	92	45	71	19	25th	74.0	12th	0	0	0	0	0
Feb	35.5	61.0	22nd	13.8	27th	42.2	62.8	22nd	24.0	13th	91	39	68	19	24th	68.4	3rd	0	0	0	0	0
Mar	39.0	63.4	14th	14.6	15th	47.6	67.6	12th	27.4	26th	86	35	59	16	14th	80.5	12th	2	0	0	0	0
Apr	50.5	67.4	23rd	22.7	5th	57.6	71.1	17th	36.2	5th	89	33	62	13	5th	81.5	23rd	11	0	0	0	0
May	55.1	68.3	26th	25.4	1st	61.2	75.2	27th	42.7	2nd	84	38	63	18	1st	87.5	27th	17	11	5	0	0
Jun	59.9	70.5	21st	43.4	6th	66.2	77.4	21st	48.7	6th	73	40	59	27	7th	90.9	21st	27	19	9	3	1
Jul	63.8	74.2	31st	49.1	9th	69.5	77.9	15th	53.7	9th	75	40	59	27	18th	90.8	16th	30	27	26	19	5
Aug	67.5	79.0	29th	55.3	18th	71.8	80.9	4th	61.4	13th	79	48	66	37	4th	93.9	4th	30	30	26	19	14
Sep	61.5	72.8	4th	37.3	29th	65.9	76.3	3rd	45.7	30th	88	45	70	26	29th	87.7	4th	24	9	5	0	0
Oct	48.9	68.0	18th	26.6	15th	55.2	71.1	18th	30.7	24th	86	40	65	20	15th	81.6	5th	8	0	0	0	0
Nov	42.6	65.7	16th	18.5	4th	48.8	67.1	16th	27.3	4th	86	45	69	22	4th	80.1	15th	1	0	0	0	0
Dec	40.1	67.2	1st	7.1	8th	45.8	67.9	1st	17.2	9th	88	44	70	20	9th	72.1	1st	0	0	0	0	0
Year	50.4	79.0	29-Aug	7.1	8-Dec	56.5	80.9	4-Aug	17.2	9-Dec	85	41	65	13	5-Apr	93.9	4-Aug	150	96	71	41	20

Table 1(c) - Means and Extremes of SRS Meteorological Data for 2006 (cont'd)

Month	Wind Speed (mph)				Barometric Pressure (mb)					Solar Radiation (ly)						Degree Days					
	Monthly Average	Max 15-min Average	Max Instantaneous	Date Max Inst.	Average	Lowest	Low Date	Highest	High Date	Average Daily Total	% of Theoretical Max	Minimum Daily Total	Date	Maximum Daily Total	Date	Heating Degree Days	Daily maximum	Date	Cooling Degree Days	Daily Maximum	Date
Jan	4.6	21.7	40.6	14th	1007.8	990.8	14th	1026.6	27th	236	0.66	23	22nd	365	31st	434	27	7th	0	0	
Feb	4.4	17.0	34.5	4th	1007.8	988.8	4th	1019.2	19th	276	0.61	15	11th	458	26th	496	30	13th	0	0	
Mar	4.7	18.5	39.0	14th	1007.6	995.8	21st	1017.5	27th	376	0.66	53	20th	570	27th	317	20	21st	17	6	13th
Apr	4.4	19.6	36.4	19th	1004.8	991.8	17th	1018.1	12th	503	0.74	91	8th	626	24th	61	11	10th	101	11	15th
May	4.3	16.3	43.4	19th	1001.3	992.4	18th	1012.8	1st	523	0.70	159	8th	682	19th	35	6	1st	193	17	27th
Jun	4.0	14.5	28.6	8th	1004.3	992.1	14th	1013.0	17th	561	0.71	125	13th	698	7th	0	0		342	18	11th
Jul	3.7	15.3	41.7	22nd	1007.2	998.8	22nd	1013.8	2nd	551	0.72	198	6th	692	24th	0	0		473	20	15th
Aug	3.6	10.1	28.0	11th	1004.8	997.8	30th	1011.7	7th	482	0.68	112	12th	638	2nd	0	0		479	21	3rd
Sep	4.0	14.9	28.9	5th	1004.7	996.9	28th	1011.8	12th	425	0.70	77	13th	563	20th	3	3	30th	240	14	3rd
Oct	4.2	17.3	29.6	28th	1005.5	989.7	28th	1015.0	3rd	348	0.70	65	27th	494	3rd	152	21	25th	70	9	20th
Nov	4.0	13.6	31.4	16th	1007.1	987.6	16th	1022.5	4th	278	0.70	56	22nd	421	3rd	343	24	21st	2	2	30th
Dec	3.3	15.3	30.1	7th	1012.6	992.9	25th	1025.6	9th	209	0.63	17	22nd	343	9th	449	34	9th	4	4	1st
Year	4.1	21.7	43.4	19-May	1006.3	987.6	16-Nov	1026.6	27-Jan	397	0.68	15	11-Feb	698	7-Jun	2291	34	9-Dec	1921	21	3-Aug

Table 2. Monthly and Annual Average and Extreme Temperatures, 1976-2006

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1976	44.2	55.7	61.5	64.8	68.9	75.6	80.4	78.0	73.1	60.1	48.7	44.8	63.0
1977	35.3	47.1	60.0	66.9	73.3	80.6	83.6	80.6	77.9	62.1	58.2	46.7	64.4
1978	39.3	41.3	54.2	65.7	70.9	79.7	82.1	81.2	77.1	65.6	60.7	49.6	64.0
1979	42.1	44.6	57.5	64.5	71.3	75.1	79.6	80.5	73.4	64.8	57.4	47.4	63.2
1980	45.9	44.3	52.6	63.5	71.2	78.3	83.8	82.5	79.2	62.7	52.8	46.0	63.6
1981	40.4	48.5	53.0	67.0	68.6	81.3	81.3	76.3	74.0	62.1	54.4	43.2	62.5
1982	43.0	50.0	58.9	62.4	75.7	78.8	80.9	80.1	75.0	66.2	58.7	54.8	65.4
1983	43.3	48.0	55.3	59.4	66.8	76.7	84.3	83.9	74.8	67.2	56.4	45.8	63.5
1984	45.0	51.7	56.5	62.6	71.9	80.1	80.1	80.8	74.0	73.4	53.4	56.9	65.5
1985	42.9	49.5	60.2	67.5	74.5	80.8	81.1	79.7	75.7	70.8	65.5	45.4	66.1
1986	45.4	54.6	57.9	66.4	74.4	82.7	86.9	80.1	78.4	67.1	61.3	49.3	67.0
1987	46.2	48.6	56.5	62.3	74.5	79.9	82.8	83.8	76.6	60.7	59.1	52.9	65.3
1988	42.3	47.8	56.8	64.2	70.4	76.8	81.6	81.4	75.4	61.2	58.0	49.1	63.8
1989	52.2	52.0	58.3	64.2	70.6	79.8	81.4	80.9	75.3	67.3	52.4	44.2	64.9
1990	54.9	57.5	60.0	64.0	72.9	80.5	83.7	83.8	79.0	69.4	59.9	54.6	68.4
1991	47.9	54.1	60.3	69.2	76.9	79.5	83.6	81.2	77.4	68.1	55.4	54.0	67.3
1992	49.5	54.1	57.2	65.0	71.2	78.9	83.7	80.7	76.9	65.0	57.1	48.0	65.6
1993	51.7	47.8	53.2	58.9	69.7	78.2	83.6	80.0	75.2	62.8	55.2	43.6	63.3
1994	41.5	50.1	60.2	68.0	71.2	82.3	81.8	81.2	77.4	67.2	62.3	53.3	66.4
1995	45.5	49.9	58.6	65.9	73.5	75.0	79.9	79.0	71.8	65.9	50.8	43.8	63.3
1996	44.6	50.1	50.6	61.6	72.9	76.5	79.3	76.0	72.7	62.1	51.6	48.8	62.2
1997	48.2	52.9	63.3	61.2	68.5	74.0	80.2	79.0	75.0	64.1	51.6	47.0	63.8
1998	49.7	51.1	53.6	62.7	74.6	82.1	82.6	80.3	75.8	66.9	60.5	53.6	66.1
1999	51.9	51.6	53.4	67.2	69.7	76.6	80.7	82.9	73.8	64.3	58.1	48.6	64.9
2000	44.4	50.2	58.5	60.7	75.1	78.0	79.9	77.6	71.7	62.5	53.1	38.2	62.5
2001	43.8	52.4	53.0	63.9	71.3	75.3	77.7	78.8	71.2	62.2	60.0	52.4	63.5
2002	47.3	48.0	57.6	68.1	70.2	77.5	80.5	78.4	75.4	66.7	51.7	44.5	63.8
2003	42.0	47.5	57.6	61.6	70.6	75.2	77.3	77.7	71.9	63.7	58.2	42.9	62.2
2004	43.7	45.2	58.5	63.4	74.0	77.7	80.1	77.3	73.2	66.2	56.1	45.8	63.4
2005	47.9	49.0	53.1	60.9	68.0	75.4	79.4	78.8	77.0	64.7	56.1	44.3	62.9
2006	50.8	47.3	55.3	66.3	70.1	76.2	80.3	80.5	72.9	62.4	53.6	50.6	63.8

Avg	45.6	49.8	56.9	64.2	71.7	78.2	81.4	80.1	75.1	65.0	56.4	48.1	64.4
Lowest Mon	35.3	41.3	50.6	58.9	66.8	74.0	77.3	76.0	71.2	60.1	48.7	38.2	62.2
Yr Lowest	1977	1978	1971	1993	1983	1997	1967	1973	1973	1976	1976	2000	1996
Rec Low	-3	10	11	29	38	48	56	56	41	28	18	5	-3
Yr Rec	1985	1996	1980	1983	1989	1984	1963	1986	1967	1976	1970	1962	1985
Highest Mon	54.9	57.5	63.3	69.2	76.9	82.7	86.9	83.9	79.2	73.4	65.5	56.9	68.4
Yr Highest	1974	1990	1997	1991	1991	1986	1986	1983	1980	1984	1985	1971	1990
Rec High	86	86	90	99	102	105	107	107	104	96	89	82	107
Yr Rec	1975	1989	1974	1986	1963	1985	1986	1983	1990	1986	1987	1984	1986

Table 3. Monthly and Annual Rainfall, 1976-2006

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1976	4.18	1.08	3.83	2.50	10.90	4.35	1.95	1.64	5.48	4.92	4.19	5.08	50.10
1977	3.72	1.62	6.86	1.27	1.79	2.47	3.42	7.30	5.50	4.27	1.63	3.86	43.71
1978	10.02	1.31	3.06	3.53	3.64	3.42	4.11	5.10	4.06	0.06	3.54	1.87	43.72
1979	3.59	7.74	3.09	6.49	8.94	1.54	7.85	2.12	6.13	1.35	3.95	2.17	54.96
1980	5.12	3.48	10.96	1.69	3.49	2.99	0.90	2.03	5.86	2.14	2.50	1.91	43.07
1981	0.89	5.02	4.72	2.07	6.90	4.29	3.96	5.79	0.54	2.81	1.00	9.55	47.54
1982	3.94	4.46	2.51	5.68	2.73	4.28	11.49	5.02	4.62	3.87	2.41	4.85	55.86
1983	3.75	7.22	6.62	5.77	1.67	6.57	4.85	6.32	3.56	1.92	5.39	4.15	57.79
1984	3.51	7.09	6.05	8.00	9.79	2.54	7.28	5.52	0.60	0.31	0.90	1.38	52.97
1985	3.01	6.92	1.31	0.84	1.70	4.62	8.10	4.38	0.49	6.34	6.36	2.48	46.55
1986	1.46	3.58	4.08	1.45	3.84	3.03	2.96	10.90	1.54	4.19	5.82	5.83	48.68
1987	7.39	7.55	4.97	0.70	3.57	5.64	4.87	4.93	3.56	0.29	2.74	1.42	47.63
1988	4.15	3.19	2.91	4.78	2.85	7.12	1.78	6.80	4.40	3.39	2.17	2.91	46.45
1989	1.42	3.59	5.52	4.89	2.60	6.67	11.46	3.27	4.87	3.36	3.00	4.41	55.06
1990	3.07	2.38	2.37	1.21	2.95	0.89	7.31	8.07	0.62	19.62	1.41	1.57	51.47
1991	7.03	1.84	7.89	4.73	3.06	2.17	7.89	9.26	4.40	0.99	1.55	3.32	54.13
1992	4.45	3.89	2.98	2.40	1.34	6.27	3.69	4.83	6.38	3.11	7.78	2.86	49.98
1993	7.45	3.62	8.37	1.74	1.43	3.27	3.12	2.23	7.29	0.99	1.87	1.81	43.19
1994	4.80	3.91	6.42	1.05	1.45	5.08	7.47	3.47	0.99	10.01	3.05	4.62	52.32
1995	6.96	7.97	0.92	1.28	1.77	8.15	5.71	6.92	5.75	2.64	2.38	4.47	54.92
1996	3.65	2.43	6.64	2.40	2.96	3.04	5.57	6.91	3.67	2.16	2.32	3.20	44.95
1997	4.20	5.45	2.69	4.38	2.38	6.90	7.09	2.01	4.89	4.08	5.51	9.09	58.67
1998	7.73	8.90	6.69	7.35	4.05	4.65	5.27	2.88	4.81	0.78	0.82	1.80	55.73
1999	5.31	2.29	3.44	1.95	1.26	7.52	4.91	3.14	4.46	2.57	1.50	1.21	39.56
2000	5.77	0.73	3.95	1.34	1.36	4.74	2.47	4.49	7.70	0.02	3.50	1.53	37.60
2001	3.11	2.68	7.21	1.28	3.85	6.49	4.79	3.55	3.33	0.50	1.03	0.54	38.36
2002	2.85	2.13	3.86	2.58	1.69	2.30	5.95	5.47	3.45	3.19	4.00	3.58	41.05
2003	1.73	5.00	7.09	8.43	5.57	10.99	8.91	4.59	2.70	3.03	1.21	1.93	61.18
2004	2.85	6.71	0.81	1.34	3.45	6.41	1.23	2.96	10.26	1.02	3.17	2.69	42.90
2005	2.14	3.89	6.09	1.69	2.87	8.23	5.81	4.08	0.19	3.60	2.67	6.16	47.42
2006	3.38	2.90	1.76	2.41	1.83	6.89	5.22	2.19	2.50	1.66	2.98	4.56	38.28

Avg	4.28	4.21	4.70	3.14	3.47	4.95	5.40	4.78	4.02	3.20	2.98	3.45	48.57
Min	0.89	0.73	0.81	0.70	1.31	0.89	0.90	1.04	0.19	0.02	0.21	0.46	28.82
Yr Min	1981	2000	2004	1972	1965	1990	1980	1963	2005	2000	1958	1955	1954
Max	10.02	8.90	10.96	8.43	10.90	10.99	11.49	10.90	10.26	19.62	7.78	9.55	73.47
Yr Max	1978	1998	1980	2003	1976	2003	1982	1964	2004	1990	1992	1997	1964

Table 4 - SRS Rainfall (in inches) for 2006, Manual Gauges

Month	700-A	Barricade 2	Barricade 3	Barricade 5	100-C	400-D	200-F	200-H	100-K	100-L	100-P	SRNL
Jan	3.06	3.19	3.84	2.42	3.25	3.19	3.47	3.48	3.93	3.36	3.85	2.94
Feb	2.69	2.93	3.11	3.40	2.84	2.61	3.37	3.48	3.05	2.93	3.15	2.83
Mar	2.97	3.01	2.66	1.06	1.38	1.35	2.45	2.23	2.06	1.31	1.29	2.90
Apr	3.00	2.73	2.94	2.81	2.47	2.29	3.22	4.89	2.46	2.41	2.29	2.98
May	1.66	2.09	1.34	1.21	2.36	2.34	1.53	1.60	2.08	2.26	2.39	1.60
Jun	5.28	9.43	7.47	8.41	7.21	6.00	7.73	8.95	6.35	7.27	8.18	7.23
Jul	2.39	1.96	4.55	7.75	3.84	5.26	5.88	5.48	5.35	5.99	6.19	2.59
Aug	2.35	3.70	4.82	3.65	1.92	1.59	1.49	2.99	1.92	1.69	1.31	2.54
Sep	2.31	3.33	4.60	3.76	2.33	2.81	2.34	2.16	2.79	3.15	2.69	2.43
Oct	3.48	2.56	2.81	1.66	2.88	1.77	2.53	1.43	1.72	3.11	3.25	3.48
Nov	2.55	3.24	3.09	2.99	3.36	3.76	3.25	3.20	3.14	3.27	3.08	2.61
Dec	2.70	4.09	3.91	4.28	3.77	4.40	5.12	4.85	5.29	4.67	4.49	5.03
Annual	34.44	42.26	45.14	43.40	37.61	37.37	42.38	44.74	40.14	41.42	42.16	39.16

Fig. 1 SRS Meteorological Monitoring Network

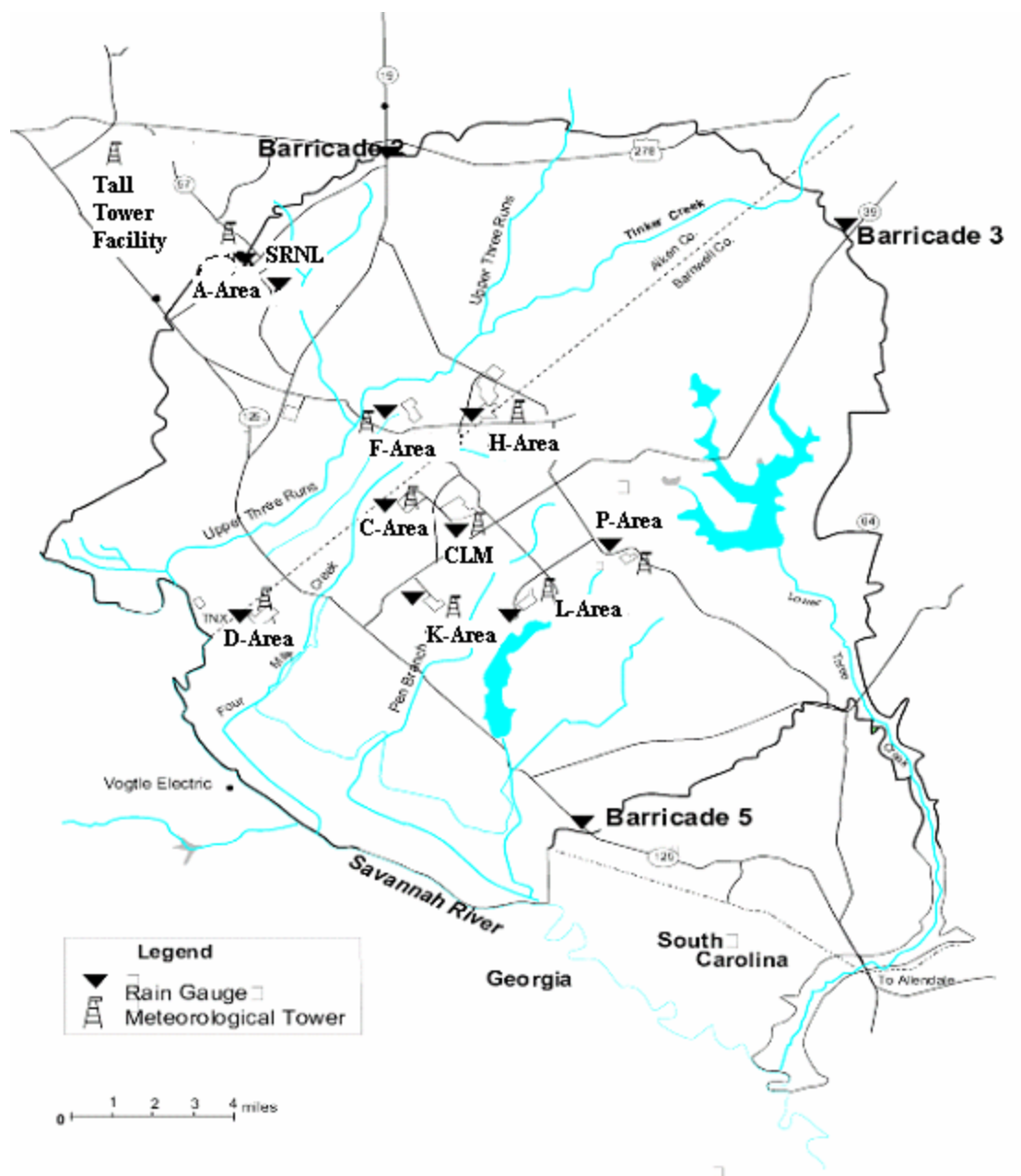


Fig. 2 - Summary of Daily Data for 2006

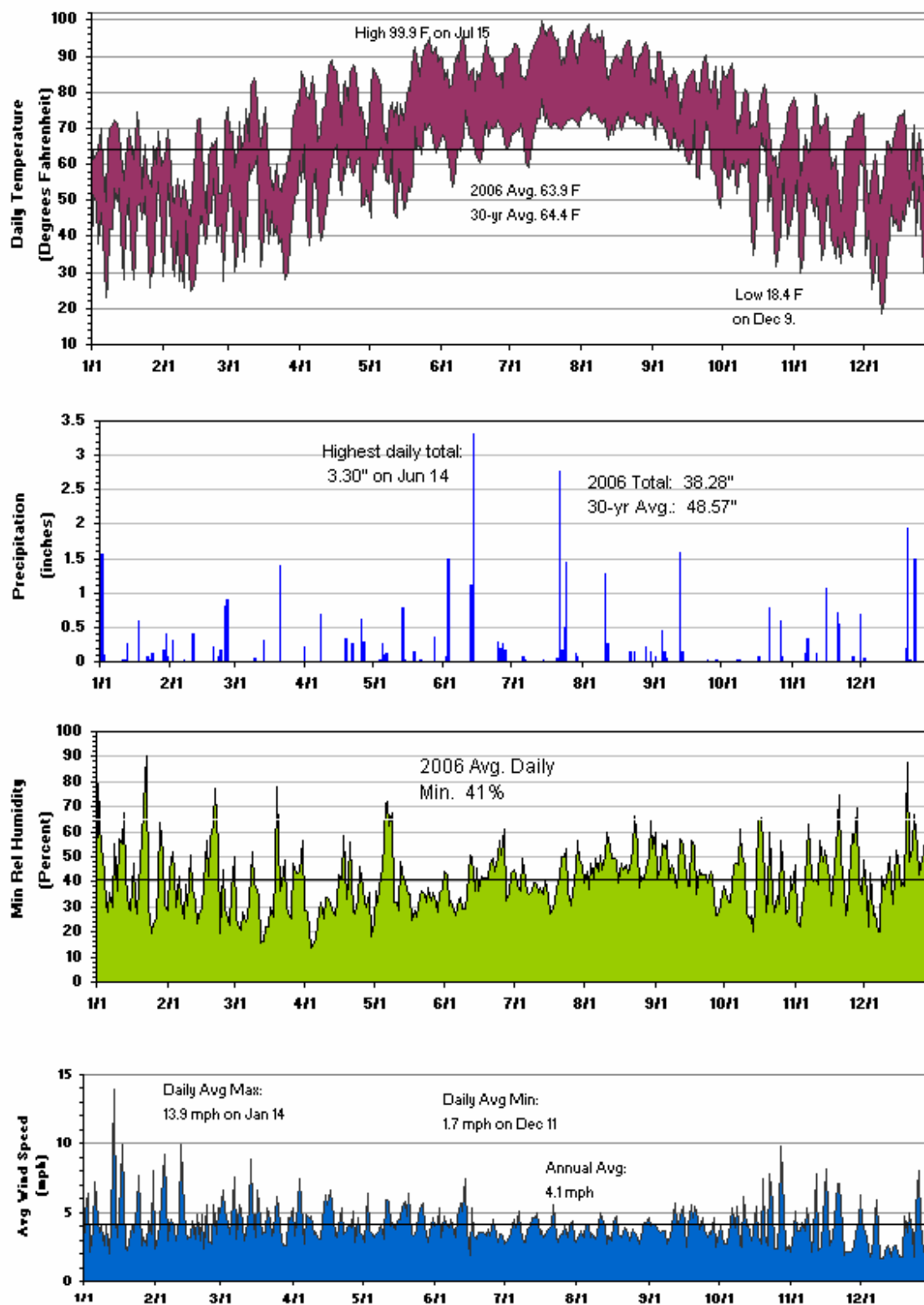


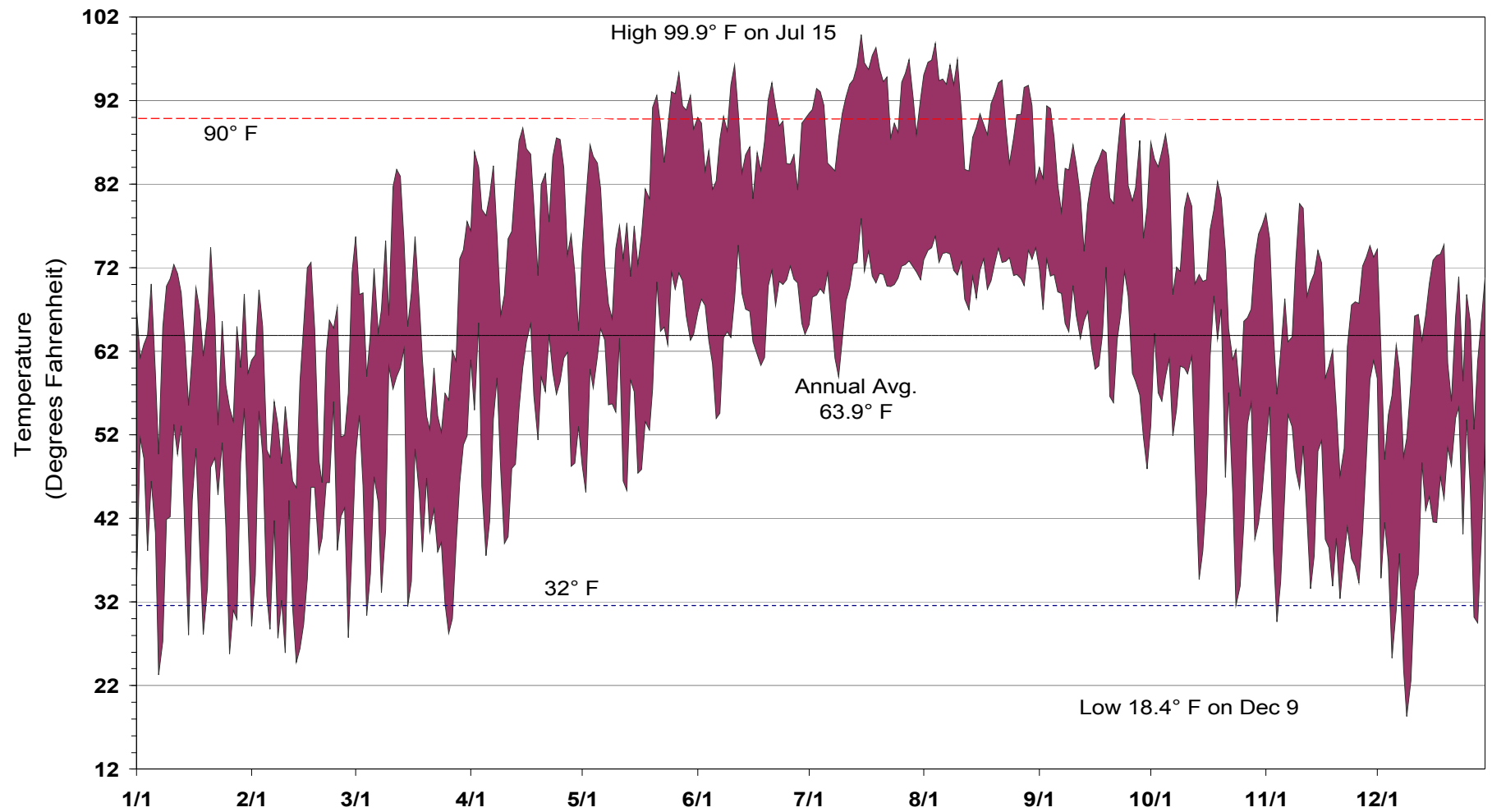
Fig. 3 - Daily High and Low Temperatures for 2006

Fig. 4 - SRS Annual Average Temperature 1976-2006

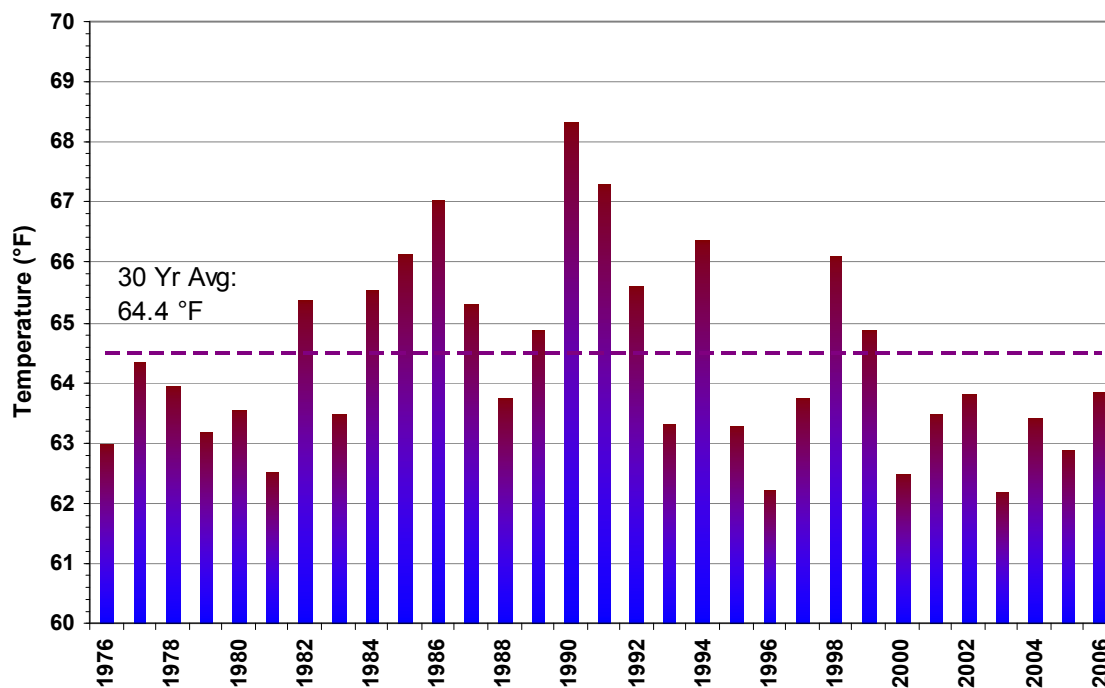


Fig. 5 - SRS Monthly Average Temperature

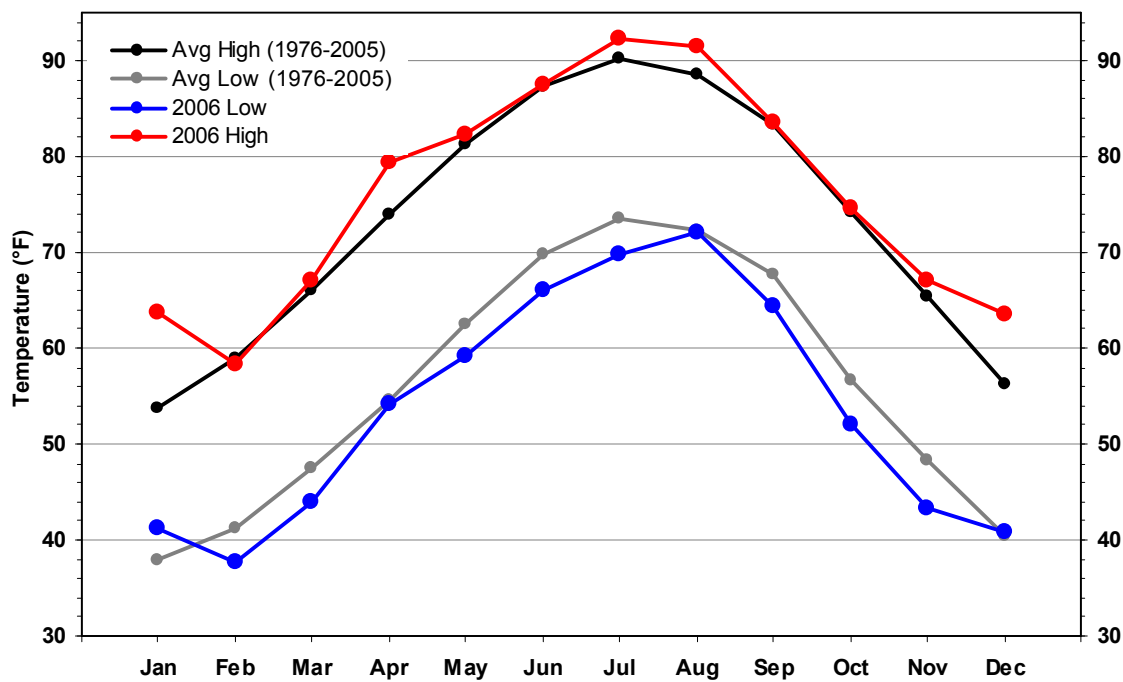
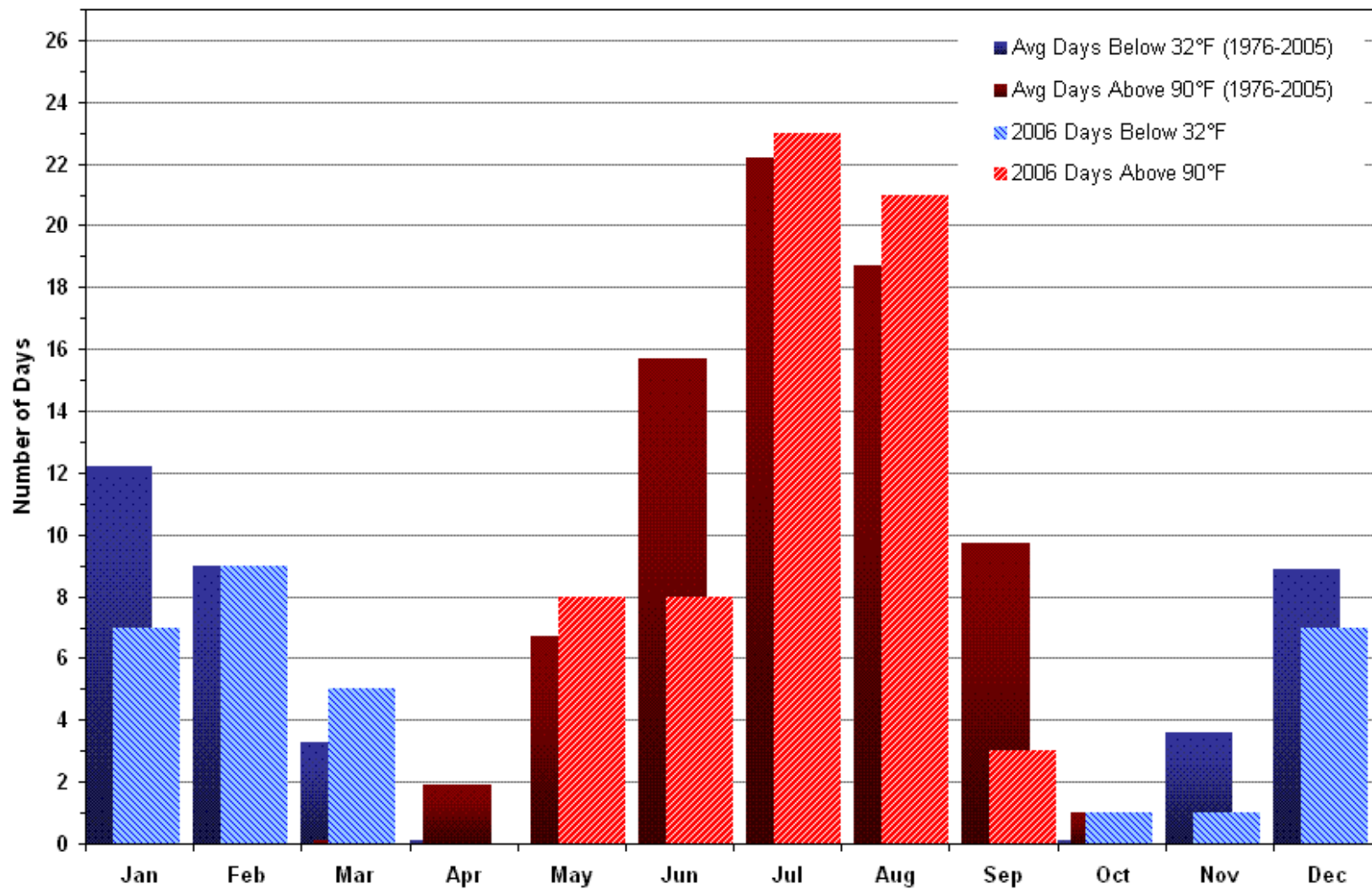


Fig. 6 - Number of Freezing (<32 F) and Sweltering (>90 F) Days



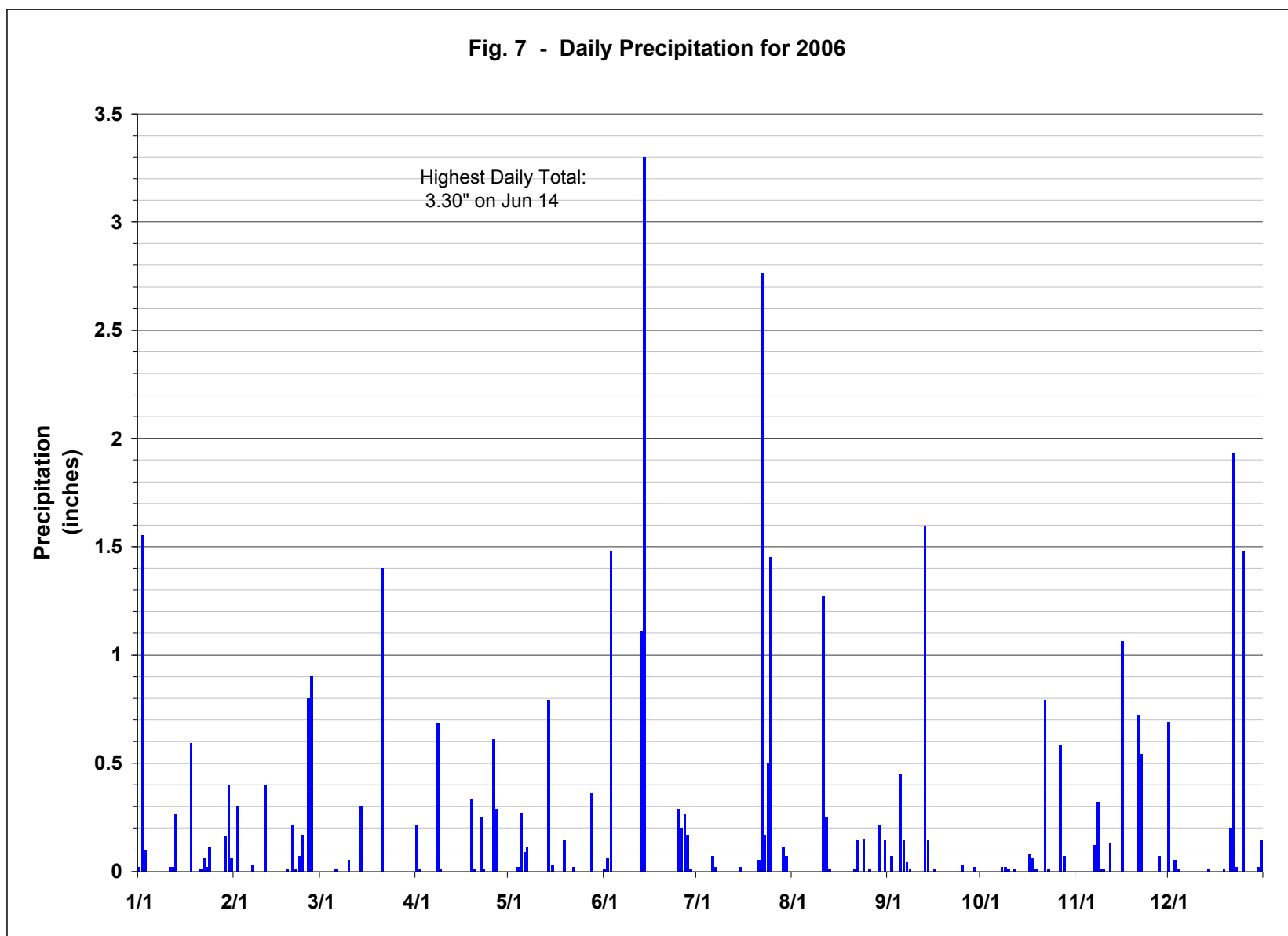


Fig. 8 - SRS Annual Precipitation 1976-2006

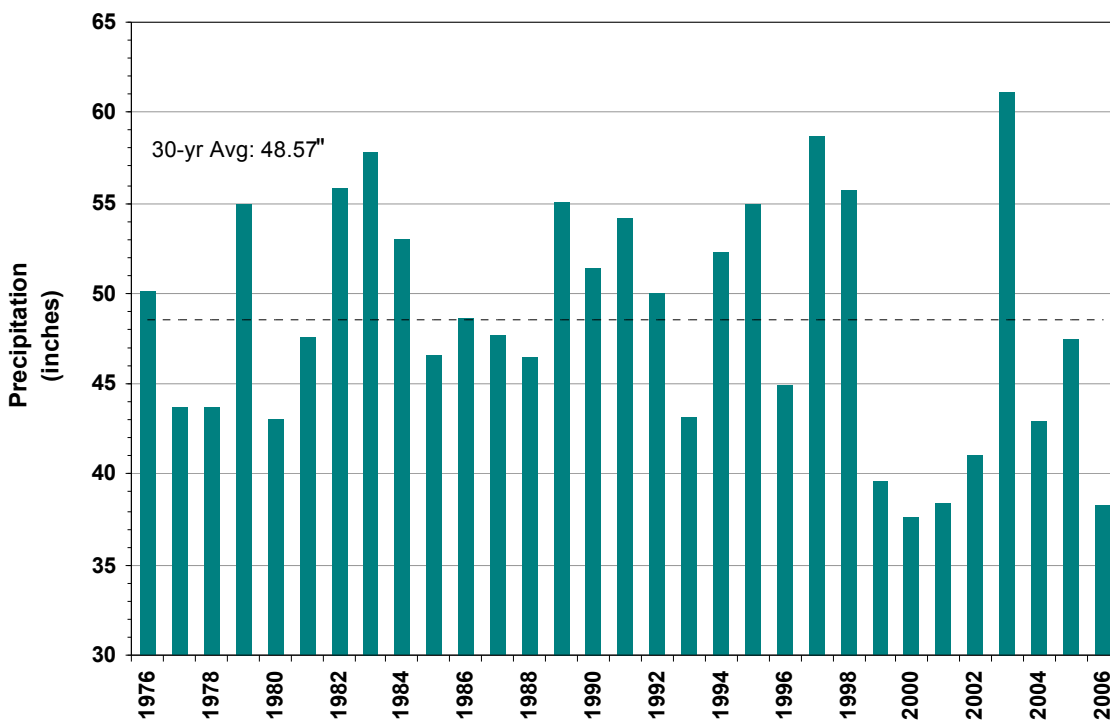


Fig. 9 - SRS Monthly Precipitation

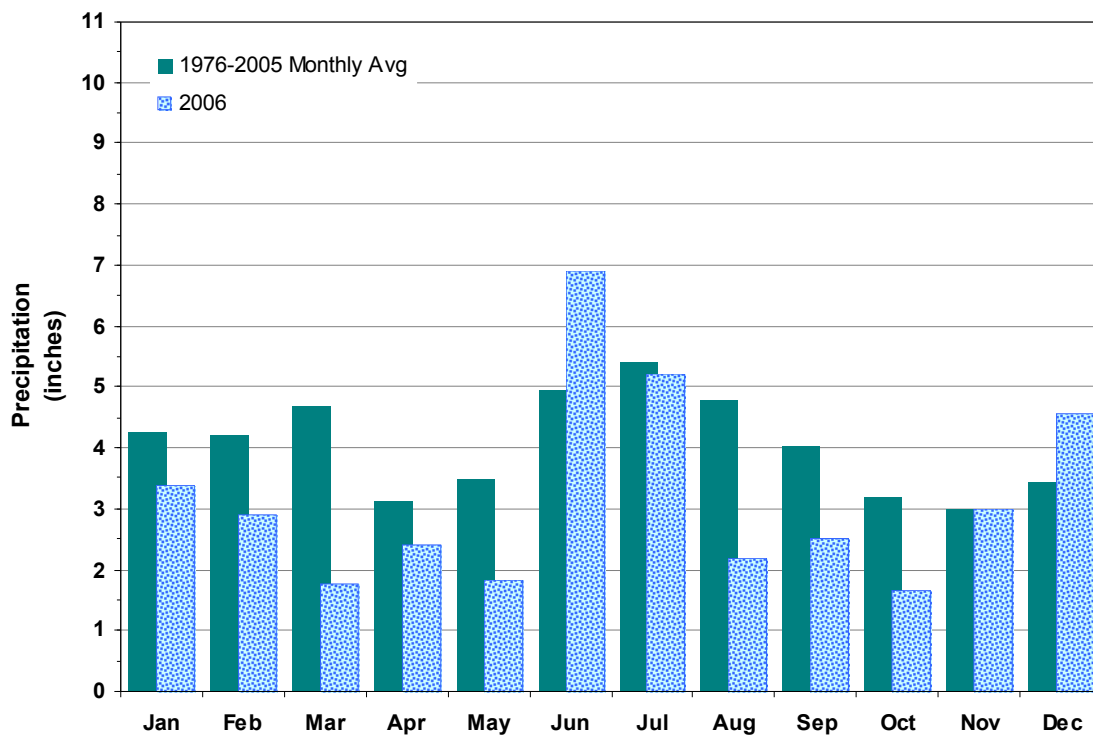


Fig. 10 - Daily High and Low Humidity for 2006

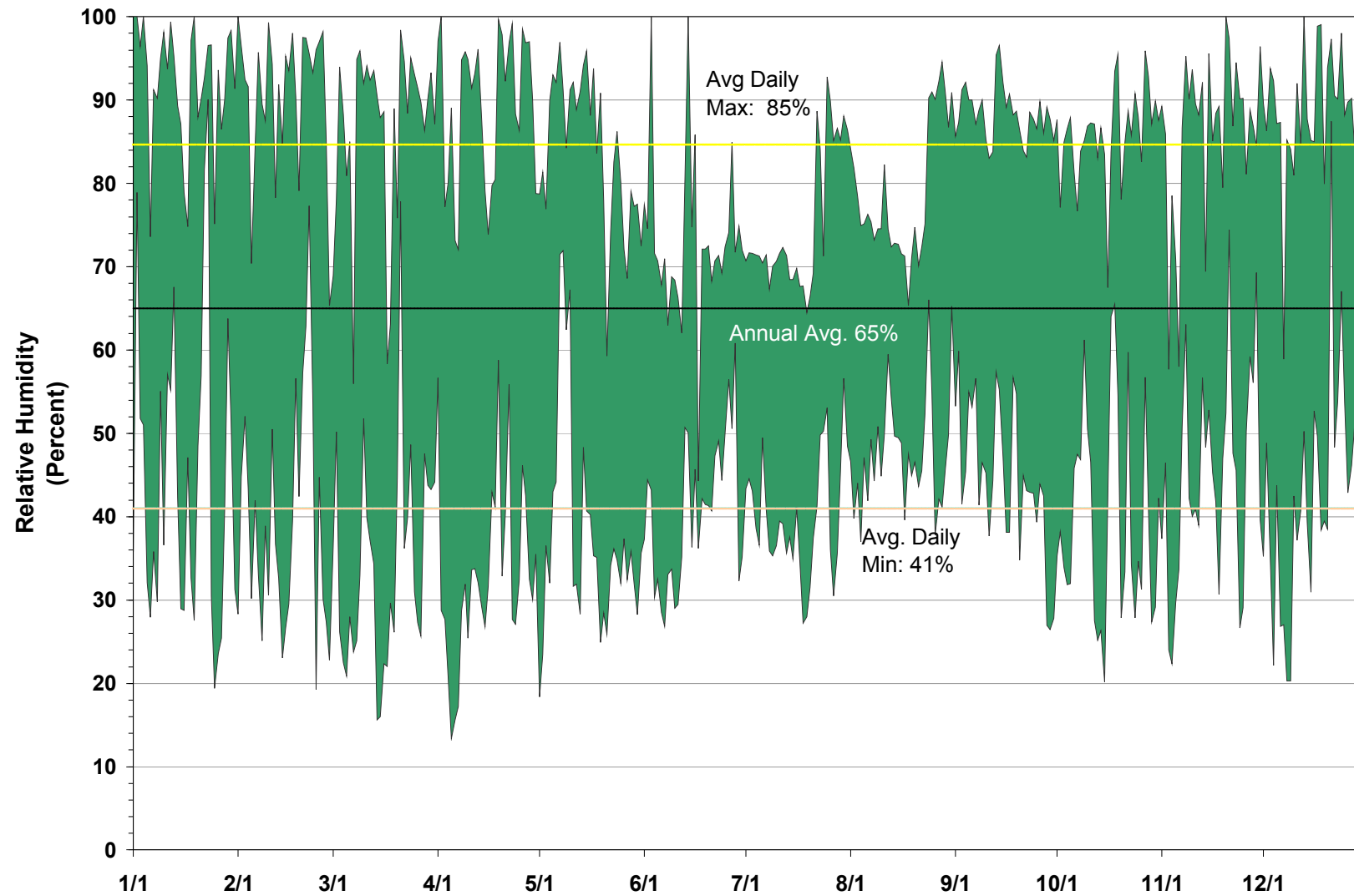


Fig. 11 - SRS Annual Average Humidity 1976-2006

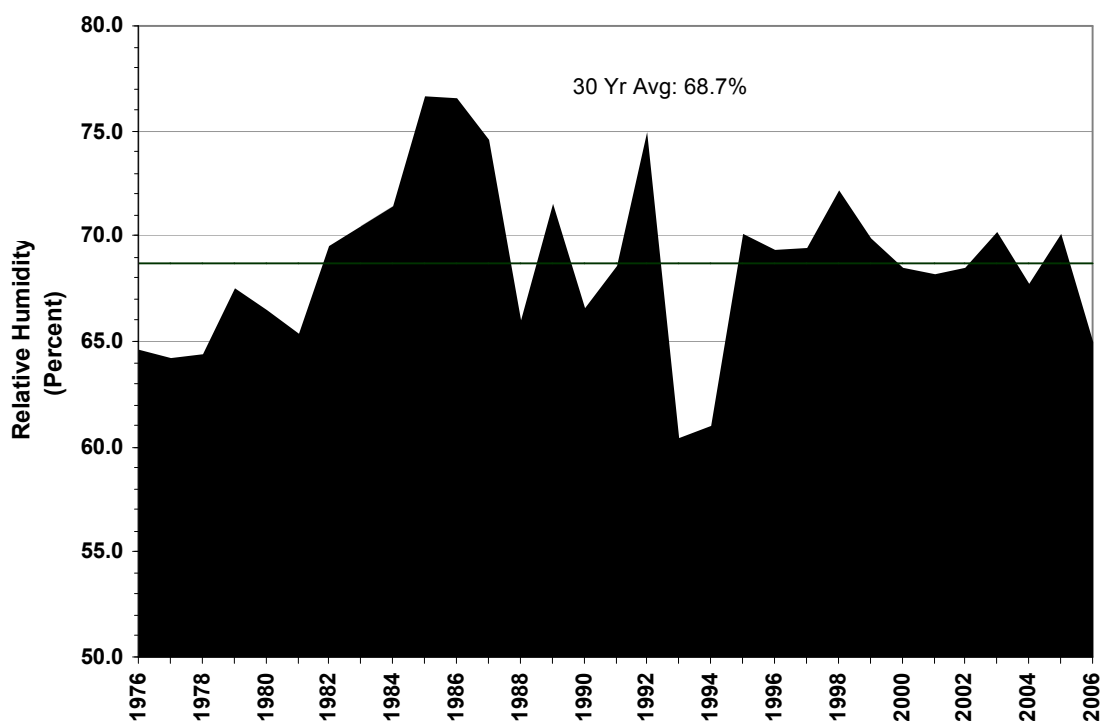


Fig. 12 - SRS Monthly Average Minimum Humidity

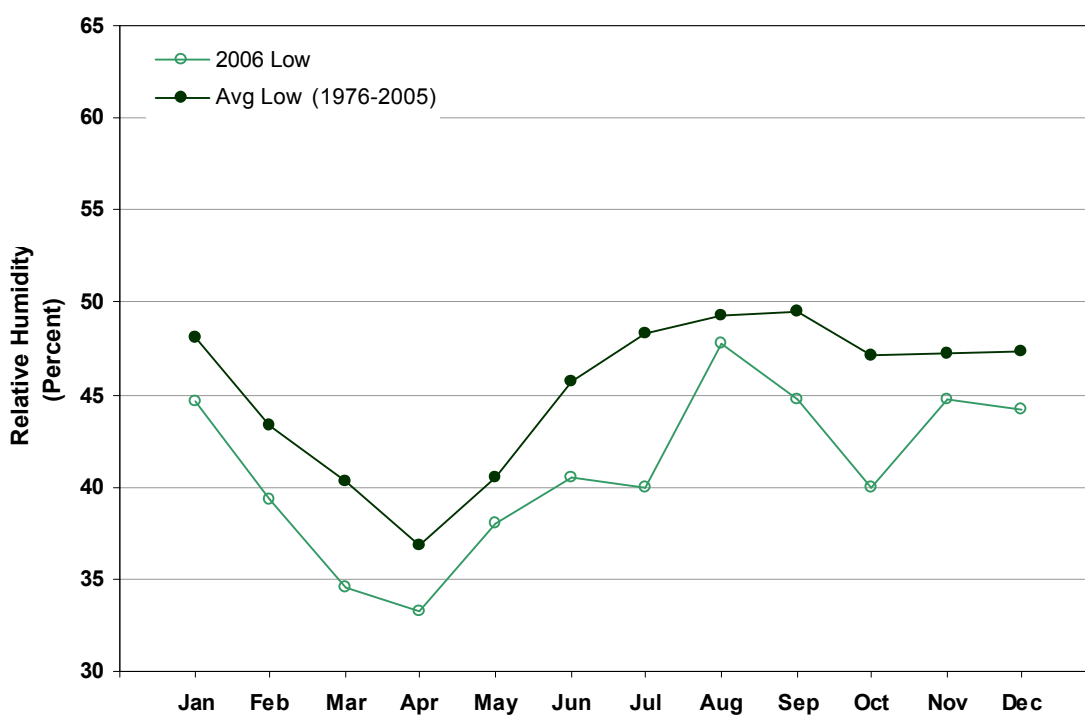


Fig. 13 - Daily Average Wind Speed for 2006

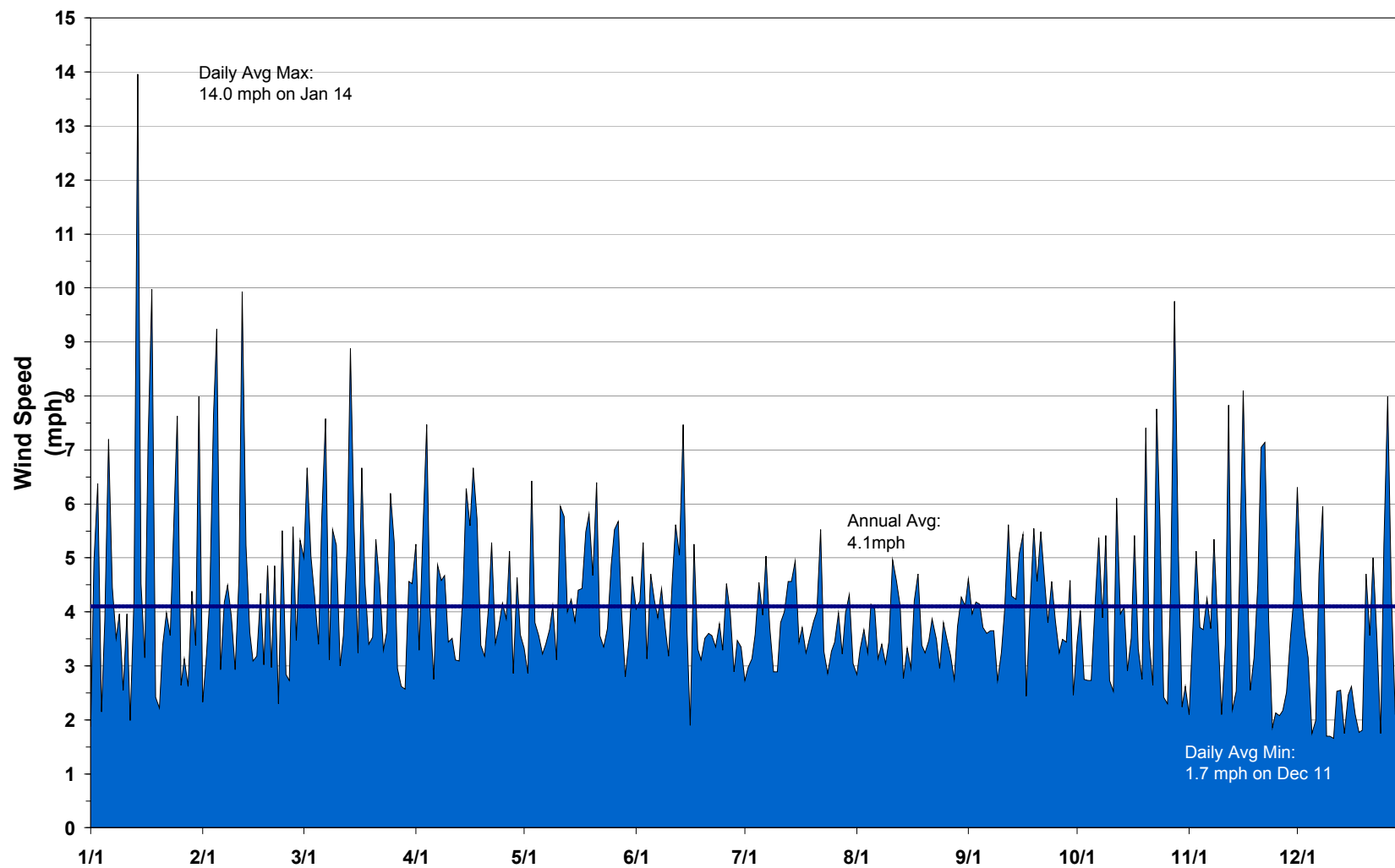
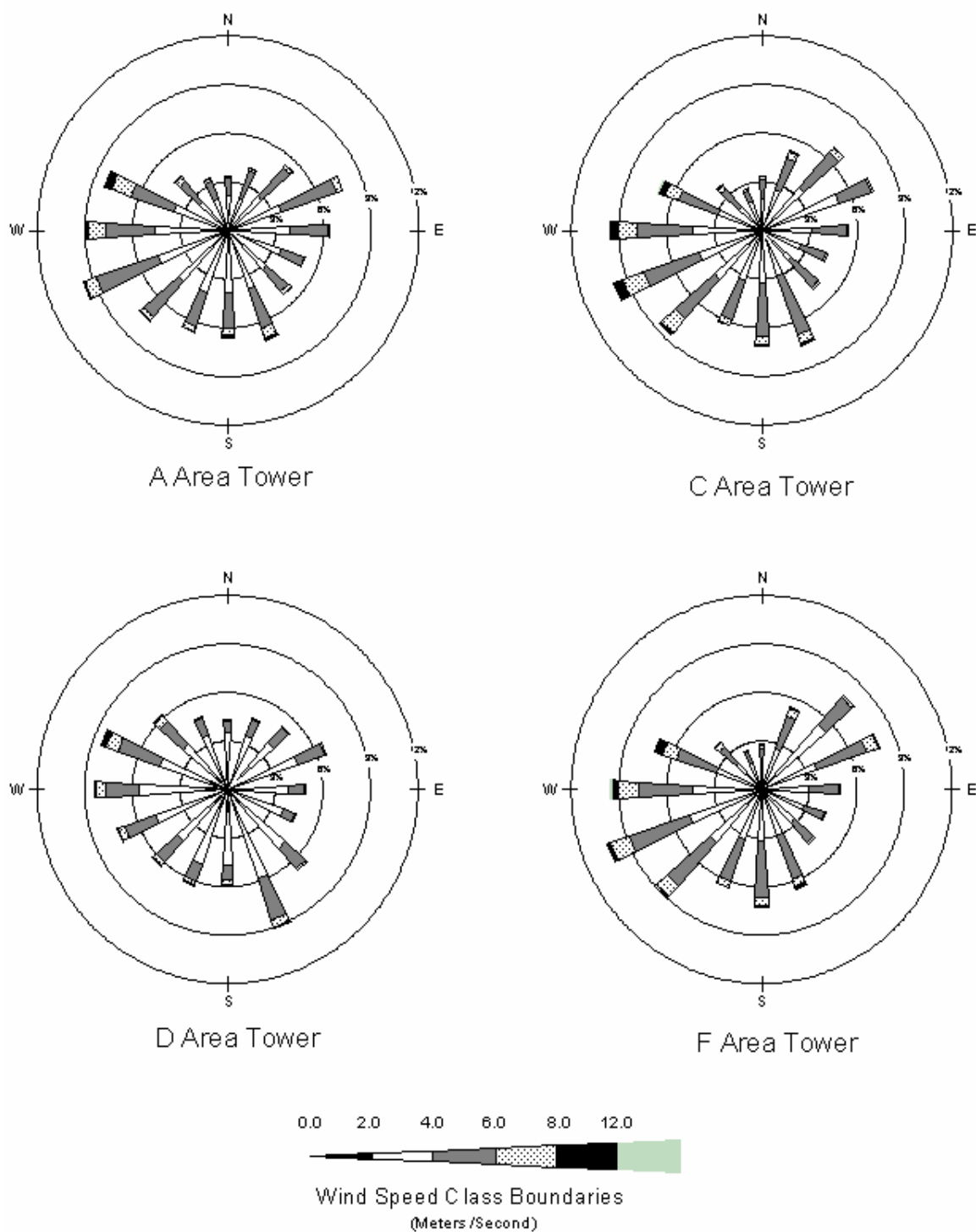
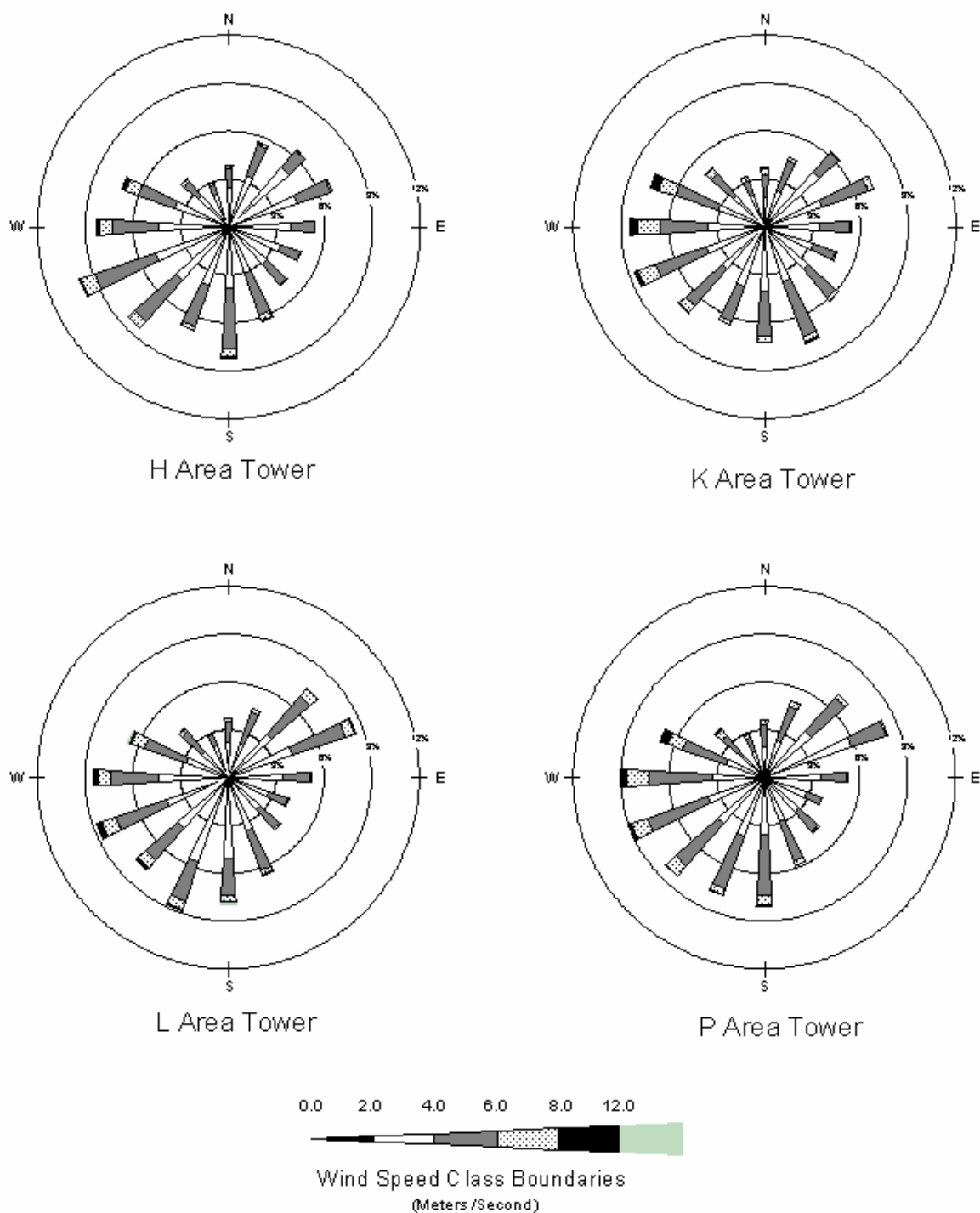


Fig. 14(a) - Annual Wind Rose Plots for 2006, 61-m Level



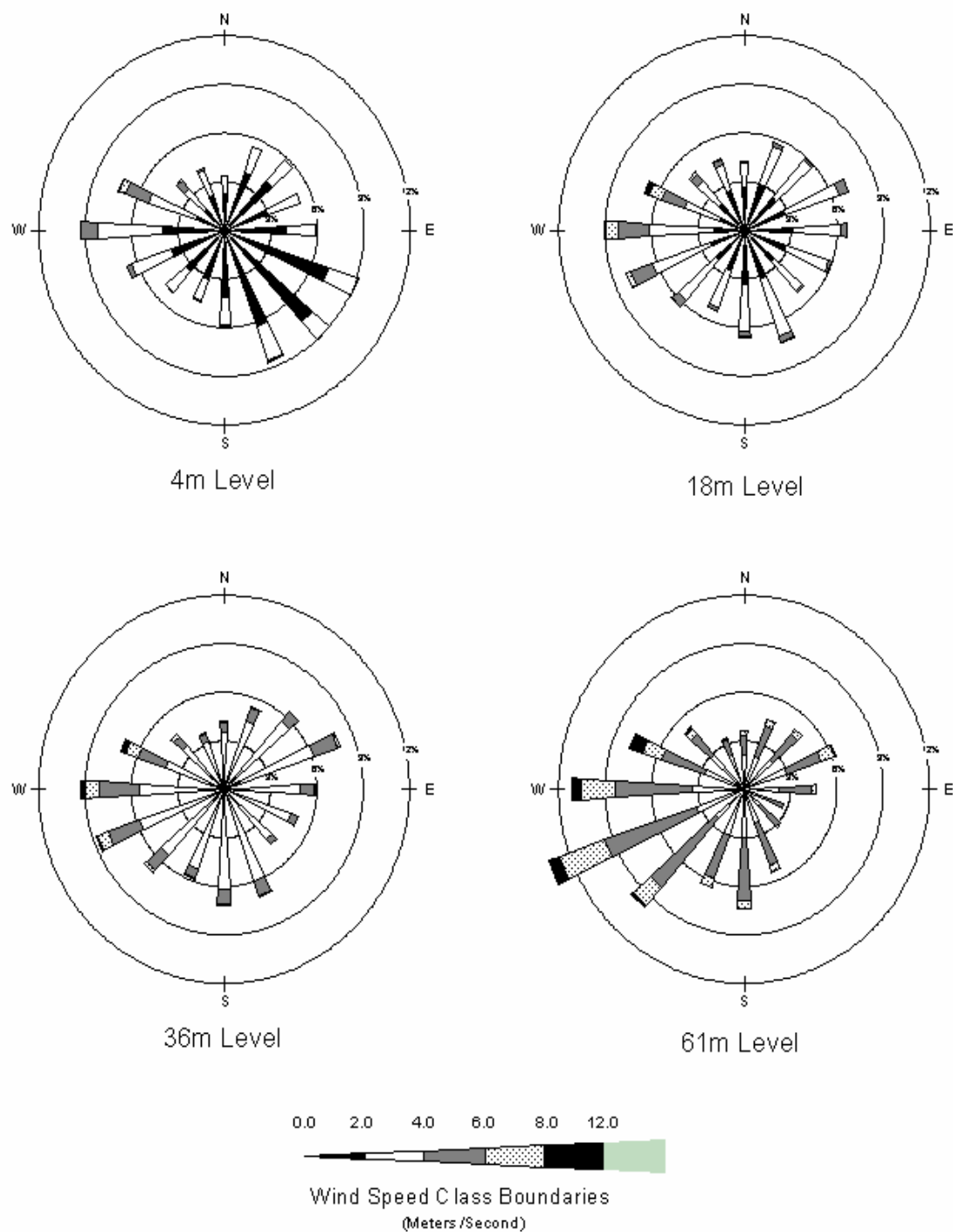
Windrose plot depicts the frequency of occurrence of wind direction sector (direction from which the wind blows) by wind speed category

Fig. 14(b) - Annual Wind Rose Plots for 2006, 61-m Level



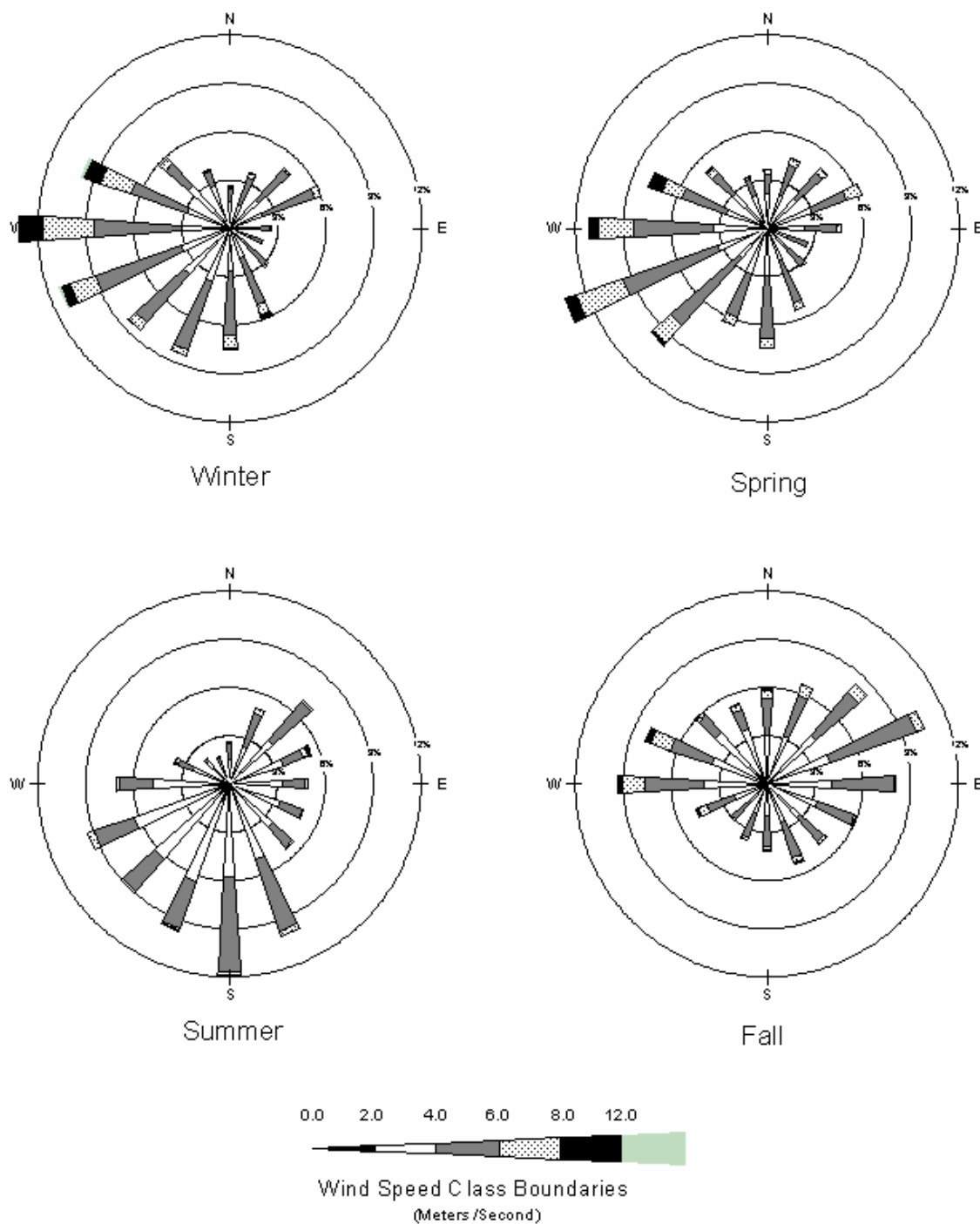
Windrose plot depicts the frequency of occurrence of wind direction sector (direction from which the wind blows) by wind speed category

Fig. 15 - Annual Wind Rose Plots for 2006, Central Climatology, All Levels



Windrose plot depicts the frequency of occurrence of wind direction sector (direction from which the wind blows) by wind speed category

Fig. 16 - Seasonal Wind Rose Plots for 2006,
Central Climatology, 61-m Level



Windrose plot depicts the frequency of occurrence of wind direction sector (direction from which the wind blows) by wind speed category

Fig. 17 - Daily Average Barometric Pressure for 2006

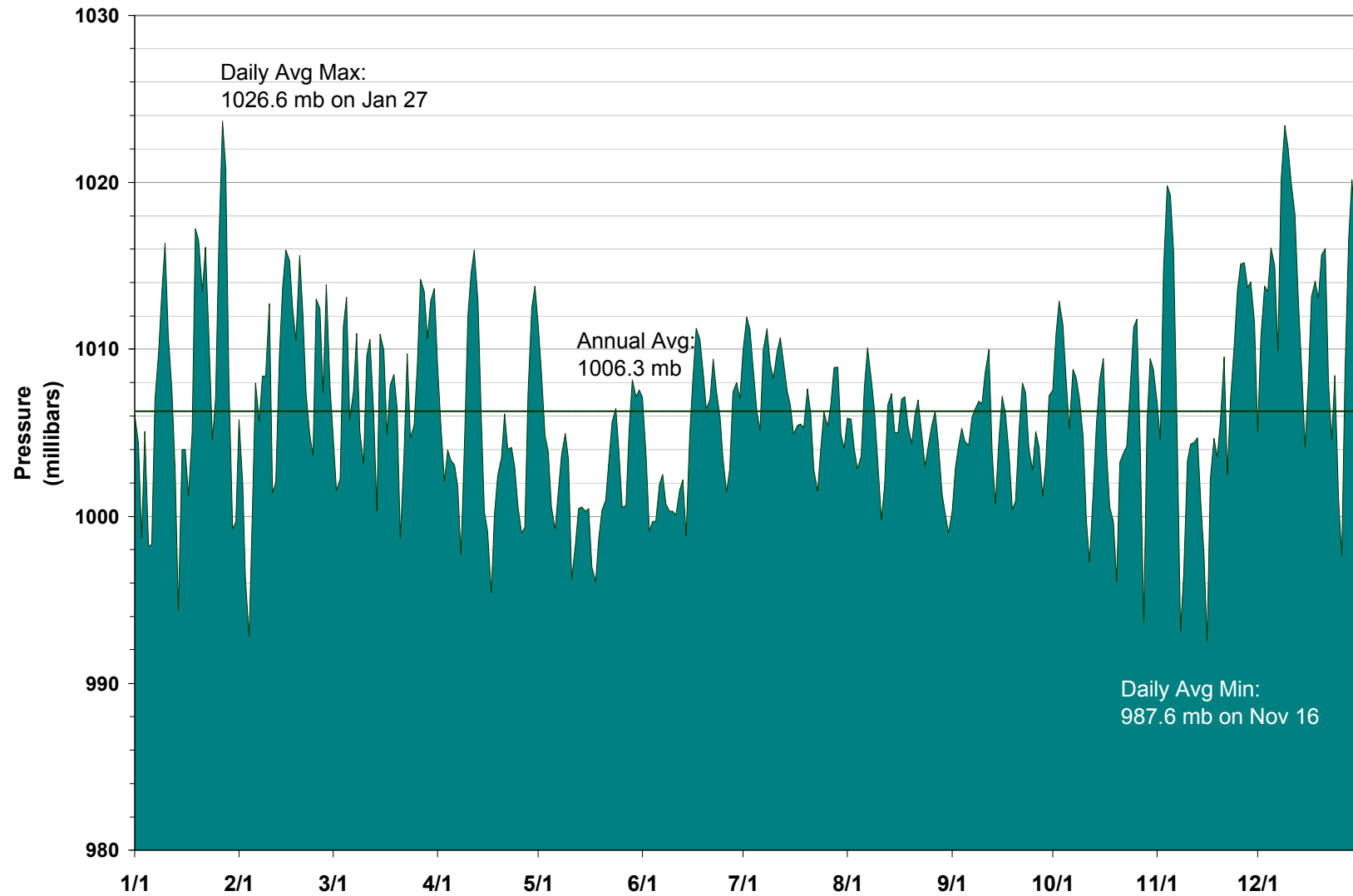
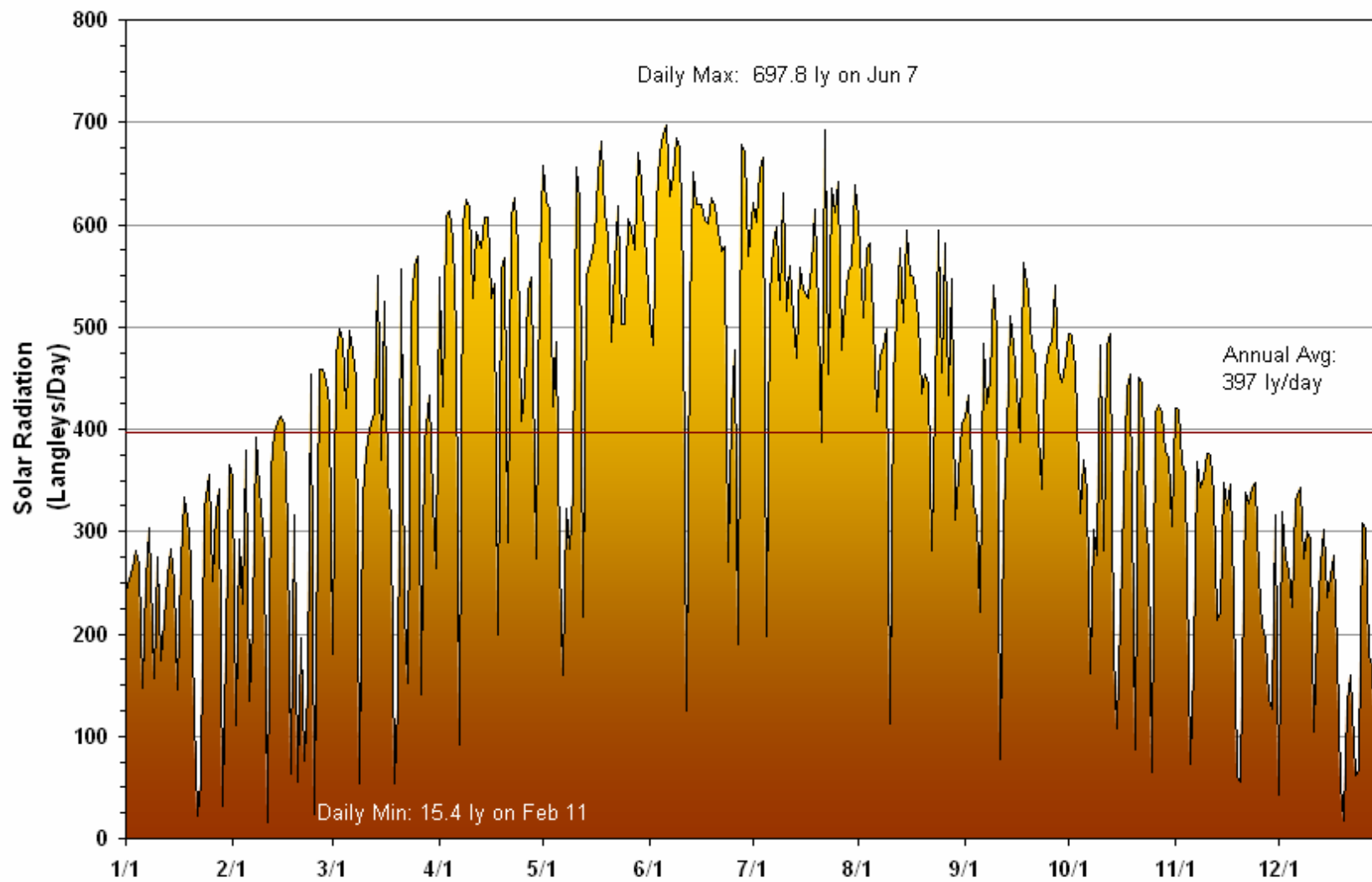


Fig. 18 - Daily Solar Radiation for 2006



**Table A.1 - Joint Occurrence Frequencies of Wind Direction Sector
by Wind Speed Category for the A Area Tower, 2006**

Sector	Wind Speed Category, meters/sec						Total
	0-2	2-4	4-6	6-8	8-12	>12	
N	0.004370	0.017709	0.010292	0.001207	0.000144	0.000000	0.033722
NNE	0.003910	0.017163	0.018054	0.001552	0.000259	0.000000	0.040938
NE	0.004542	0.023746	0.023746	0.002300	0.000172	0.000000	0.054506
ENE	0.005232	0.030444	0.036654	0.003766	0.000057	0.000000	0.076153
E	0.005462	0.033290	0.023602	0.001322	0.000057	0.000000	0.063733
ESE	0.006353	0.029122	0.015150	0.000345	0.000000	0.000000	0.050970
SE	0.006900	0.025471	0.017536	0.002472	0.000259	0.000000	0.052638
SSE	0.007359	0.031048	0.025385	0.006440	0.001466	0.000230	0.071928
S	0.006267	0.032428	0.021245	0.004801	0.001092	0.000115	0.065948
SSW	0.006210	0.034268	0.022481	0.003335	0.000086	0.000000	0.066380
SW	0.007187	0.034756	0.029150	0.002990	0.000316	0.000000	0.074399
WSW	0.008049	0.038724	0.040966	0.007791	0.001150	0.000000	0.096680
WSW	0.007733	0.038120	0.030990	0.010953	0.002444	0.000000	0.090240
WNW	0.006210	0.029697	0.028374	0.013425	0.004887	0.000029	0.082622
NW	0.004686	0.018945	0.016645	0.004053	0.000920	0.000000	0.045249
NNW	0.004283	0.016013	0.011787	0.001725	0.000086	0.000000	0.033894
Total	0.094753	0.450944	0.372057	0.068477	0.013395	0.000374	1.000000

**Table A.2 - Joint Occurrence Frequencies of Wind Direction Sector
by Wind Speed Category for the C Area Tower, 2006**

Sector	Wind Speed Category, meters/sec						Total
	0-2	2-4	4-6	6-8	8-12	>12	
N	0.003950	0.015396	0.012426	0.002076	0.000144	0.000000	0.033992
NNE	0.003950	0.022489	0.020990	0.004209	0.000317	0.000000	0.051955
NE	0.004440	0.030389	0.029178	0.003806	0.000202	0.000000	0.068015
ENE	0.007727	0.043767	0.021335	0.001240	0.000029	0.000000	0.074098
E	0.005536	0.026150	0.021191	0.001413	0.000086	0.000000	0.054376
ESE	0.004815	0.021162	0.016463	0.001557	0.000000	0.000000	0.043997
SE	0.004873	0.020125	0.021681	0.001788	0.000029	0.000000	0.048496
SSE	0.005738	0.023844	0.038606	0.006026	0.001211	0.000029	0.075454
S	0.005305	0.026756	0.033848	0.005074	0.000980	0.000000	0.071963
SSW	0.005766	0.027390	0.025285	0.003489	0.000317	0.000000	0.062247
SW	0.006199	0.033791	0.033099	0.011360	0.001816	0.000000	0.086265
WSW	0.007294	0.034771	0.036587	0.014156	0.005680	0.000029	0.098517
WSW	0.007179	0.036703	0.034713	0.011677	0.005651	0.000259	0.096182
WNW	0.005853	0.023383	0.026064	0.009313	0.004354	0.000202	0.069169
NW	0.004152	0.015079	0.014820	0.002883	0.000750	0.000000	0.037684
NNW	0.003489	0.015454	0.007179	0.001355	0.000115	0.000000	0.027592
Total	0.086266	0.416649	0.393465	0.081422	0.021681	0.000519	1.000000

**Table A.3 - Joint Occurrence Frequencies of Wind Direction Sector
by Wind Speed Category for the D Area Tower, 2006**

Sector	Wind Speed Category, meters/sec						Total
	0-2	2-4	4-6	6-8	8-12	>12	
N	0.012054	0.023103	0.007433	0.000631	0.000000	0.000000	0.043221
NNE	0.009184	0.026059	0.010418	0.001205	0.000086	0.000000	0.046952
NE	0.008782	0.030048	0.012456	0.000660	0.000057	0.000000	0.052003
ENE	0.009959	0.037223	0.017880	0.001148	0.000115	0.000000	0.066325
E	0.009643	0.028728	0.010274	0.000517	0.000086	0.000000	0.049248
ESE	0.008954	0.028154	0.007950	0.000545	0.000057	0.000000	0.045660
SE	0.011078	0.037309	0.017191	0.001177	0.000201	0.000000	0.066956
SSE	0.012570	0.045689	0.026863	0.005080	0.000689	0.000000	0.090891
S	0.013718	0.032602	0.009040	0.003214	0.001492	0.000172	0.060238
SSW	0.013460	0.035501	0.011221	0.002095	0.000430	0.000000	0.062707
SW	0.011135	0.031139	0.017880	0.002612	0.000344	0.000000	0.063110
WSW	0.011738	0.036219	0.020893	0.004133	0.000545	0.000000	0.073528
WSW	0.013862	0.042303	0.021123	0.005826	0.001119	0.000000	0.084233
WNW	0.011422	0.033636	0.027637	0.008581	0.002956	0.000000	0.084232
NW	0.010647	0.026489	0.019630	0.004563	0.001004	0.000000	0.062333
NNW	0.010992	0.024653	0.011480	0.001205	0.000029	0.000000	0.048359
Total	0.179198	0.518855	0.249369	0.043192	0.009210	0.000172	1.000000

**Table A.4 - Joint Occurrence Frequencies of Wind Direction Sector
by Wind Speed Category for the F Area Tower, 2006**

Sector	Wind Speed Category, meters/sec						Total
	0-2	2-4	4-6	6-8	8-12	>12	
N	0.003791	0.011574	0.010253	0.002183	0.000287	0.000000	0.028088
NNE	0.005141	0.021855	0.021109	0.004767	0.000833	0.000000	0.053705
NE	0.007496	0.045979	0.022343	0.001924	0.000029	0.000000	0.077771
ENE	0.005543	0.031505	0.032970	0.007725	0.000833	0.000000	0.078576
E	0.005399	0.024038	0.018811	0.001149	0.000144	0.000000	0.049541
ESE	0.006175	0.022343	0.013354	0.000574	0.000000	0.000000	0.042446
SE	0.005830	0.021568	0.015853	0.001580	0.000144	0.000000	0.044975
SSE	0.005514	0.024584	0.028690	0.004825	0.001379	0.000000	0.064992
S	0.005773	0.026249	0.034865	0.004911	0.001063	0.000000	0.072861
SSW	0.005744	0.027140	0.026881	0.003992	0.000287	0.000000	0.064044
SW	0.007611	0.035526	0.036244	0.008702	0.001005	0.000000	0.089088
WSW	0.007410	0.040437	0.040465	0.012119	0.002125	0.000000	0.102556
WSW	0.008070	0.035181	0.034348	0.013182	0.004308	0.000029	0.095118
WNW	0.006347	0.023980	0.026680	0.009018	0.005141	0.000000	0.071166
NW	0.005227	0.015853	0.014159	0.003446	0.000517	0.000000	0.039202
NNW	0.004049	0.013297	0.007352	0.001120	0.000057	0.000000	0.025875
Total	0.095120	0.421109	0.384377	0.081217	0.018152	0.000029	1.000004

**Table A.5 - Joint Occurrence Frequencies of Wind Direction Sector
by Wind Speed Category for the H Area Tower, 2006**

Sector	Wind Speed Category, meters/sec						Total
	0-2	2-4	4-6	6-8	8-12	>12	
N	0.005161	0.018979	0.012070	0.002351	0.000344	0.000000	0.038905
NNE	0.006651	0.027208	0.020126	0.001864	0.000201	0.000000	0.056050
NE	0.008085	0.041772	0.013761	0.000459	0.000029	0.000000	0.064106
ENE	0.006766	0.038217	0.022190	0.001175	0.000000	0.000000	0.068348
E	0.007311	0.031193	0.014851	0.000459	0.000057	0.000000	0.053871
ESE	0.006881	0.027752	0.013045	0.000201	0.000000	0.000000	0.047879
SE	0.005963	0.025401	0.016686	0.000889	0.000000	0.000000	0.048939
SSE	0.006766	0.024111	0.027666	0.003498	0.000803	0.000000	0.062844
S	0.006393	0.031508	0.038360	0.005304	0.000860	0.000029	0.082454
SSW	0.007196	0.031565	0.027236	0.002466	0.000143	0.000000	0.068606
SW	0.006995	0.037357	0.034604	0.005390	0.000430	0.000000	0.084776
WSW	0.006909	0.042202	0.039765	0.009002	0.001147	0.000000	0.099025
WSW	0.007053	0.037013	0.029100	0.007970	0.002437	0.000000	0.083573
WNW	0.007540	0.028383	0.024484	0.008114	0.002724	0.000000	0.071245
NW	0.006938	0.019209	0.011583	0.002036	0.000373	0.000000	0.040139
NNW	0.005361	0.016800	0.005763	0.001204	0.000115	0.000000	0.029243
Total	0.107969	0.478670	0.351290	0.052382	0.009663	0.000029	1.000003

**Table A.6 - Joint Occurrence Frequencies of Wind Direction Sector
by Wind Speed Category for the K Area Tower, 2006**

Sector	Wind Speed Category, meters/sec						Total
	0-2	2-4	4-6	6-8	8-12	>12	
N	0.004519	0.013614	0.014628	0.003505	0.000840	0.000000	0.037106
NNE	0.005098	0.018654	0.019987	0.002143	0.000203	0.000000	0.046085
NE	0.007213	0.038206	0.016453	0.000811	0.000000	0.000000	0.062683
ENE	0.007647	0.030907	0.030038	0.003621	0.000319	0.000000	0.072532
E	0.008226	0.026301	0.018770	0.000956	0.000058	0.000000	0.054311
ESE	0.009240	0.022999	0.015004	0.000579	0.000029	0.000000	0.047851
SE	0.007184	0.028763	0.023550	0.001941	0.000203	0.000000	0.061641
SSE	0.006112	0.029980	0.037048	0.003186	0.001159	0.000000	0.077485
S	0.006691	0.034006	0.028242	0.003186	0.000290	0.000000	0.072415
SSW	0.007502	0.031776	0.023723	0.002230	0.000087	0.000000	0.065318
SW	0.006315	0.029343	0.030646	0.005156	0.000811	0.000000	0.072271
WSW	0.005909	0.032587	0.033630	0.011992	0.001883	0.000000	0.086001
WSW	0.005735	0.029980	0.030357	0.013846	0.004953	0.000087	0.084958
WNW	0.006865	0.024013	0.028358	0.011239	0.005330	0.000261	0.076066
NW	0.006459	0.019842	0.018017	0.004287	0.001101	0.000000	0.049706
NNW	0.004895	0.015381	0.010341	0.002694	0.000232	0.000029	0.033572
Total	0.105610	0.426352	0.378792	0.071372	0.017498	0.000377	1.000001

**Table A.7 - Joint Occurrence Frequencies of Wind Direction Sector
by Wind Speed Category for the L Area Tower, 2006**

Sector	Wind Speed Category, meters/sec						Total
	0-2	2-4	4-6	6-8	8-12	>12	
N	0.004102	0.018140	0.013432	0.001531	0.000000	0.000000	0.037205
NNE	0.003351	0.018775	0.021231	0.002686	0.000144	0.000000	0.046187
NE	0.006441	0.029521	0.032409	0.006124	0.000202	0.000000	0.074697
ENE	0.006932	0.036020	0.034778	0.006384	0.000376	0.000000	0.084490
E	0.006153	0.027990	0.017244	0.000982	0.000087	0.000000	0.052456
ESE	0.005661	0.021346	0.012507	0.000433	0.000058	0.000000	0.040005
SE	0.004506	0.022184	0.016031	0.001127	0.000029	0.000000	0.043877
SSE	0.004882	0.030820	0.025737	0.002773	0.000924	0.000000	0.065136
S	0.007192	0.044050	0.022935	0.004102	0.001069	0.000029	0.079377
SSW	0.008348	0.047920	0.025621	0.005633	0.000722	0.000000	0.088244
SW	0.007019	0.034951	0.027036	0.006615	0.001820	0.000000	0.077441
WSW	0.007221	0.033478	0.033767	0.009850	0.003091	0.000000	0.087407
WSW	0.007366	0.036915	0.029347	0.008492	0.003091	0.000058	0.085269
WNW	0.004622	0.023426	0.027614	0.008146	0.003004	0.000116	0.066928
NW	0.005430	0.016378	0.016840	0.002253	0.000289	0.000000	0.041190
NNW	0.004679	0.017013	0.007510	0.000895	0.000000	0.000000	0.030097
Total	0.093905	0.458927	0.364039	0.068026	0.014906	0.000203	1.000000

**Table A.8 - Joint Occurrence Frequencies of Wind Direction Sector
by Wind Speed Category for the P Area Tower, 2006**

Sector	Wind Speed Category, meters/sec						Total
	0-2	2-4	4-6	6-8	8-12	>12	
N	0.003546	0.015309	0.014415	0.003056	0.000259	0.000000	0.036585
NNE	0.004757	0.019634	0.023036	0.003460	0.000519	0.000000	0.051406
NE	0.005161	0.033646	0.028370	0.003027	0.000173	0.000000	0.070377
ENE	0.008534	0.049647	0.022805	0.001182	0.000000	0.000000	0.082168
E	0.006372	0.029350	0.016145	0.000548	0.000144	0.000000	0.052559
ESE	0.005103	0.023122	0.010235	0.000317	0.000029	0.000000	0.038806
SE	0.005882	0.022978	0.015828	0.000980	0.000029	0.000000	0.045697
SSE	0.005651	0.023295	0.026842	0.002739	0.000519	0.000000	0.059046
S	0.005161	0.030503	0.038374	0.006083	0.001124	0.000086	0.081331
SSW	0.005853	0.032838	0.035404	0.003979	0.000259	0.000000	0.078333
SW	0.006026	0.032838	0.035404	0.007727	0.000894	0.000000	0.082889
WSW	0.005737	0.031253	0.040738	0.010840	0.001528	0.000000	0.090096
WSW	0.005017	0.027245	0.040680	0.013320	0.004180	0.000000	0.090442
WNW	0.004642	0.020845	0.028398	0.010379	0.005017	0.000375	0.069656
NW	0.003835	0.014531	0.017241	0.004786	0.001269	0.000000	0.041662
NNW	0.003575	0.013666	0.009947	0.001615	0.000144	0.000000	0.028947
Total	0.084852	0.420700	0.403862	0.074038	0.016087	0.000461	1.000000

**Table A.9 - Joint Occurrence Frequencies of Wind Direction Sector
by Wind Speed Category for the 4m Level Central Climatology Tower, 2006**

Sector	Wind Speed Category, meters/sec						Total
	0-2	2-4	4-6	6-8	8-12	>12	
N	0.023066	0.010621	0.000088	0.000000	0.000000	0.000000	0.033775
NNE	0.037746	0.016946	0.000294	0.000000	0.000000	0.000000	0.054986
NE	0.040571	0.017946	0.000118	0.000000	0.000000	0.000000	0.058635
ENE	0.029744	0.021742	0.000382	0.000000	0.000000	0.000000	0.051868
E	0.039453	0.019270	0.000677	0.000000	0.000000	0.000000	0.059400
ESE	0.071168	0.019712	0.000235	0.000000	0.000000	0.000000	0.091115
SE	0.075140	0.014593	0.000177	0.000000	0.000000	0.000000	0.089910
SSE	0.062371	0.022683	0.001265	0.000059	0.000000	0.000000	0.086378
S	0.041512	0.017034	0.001147	0.000206	0.000000	0.000000	0.059899
SSW	0.032274	0.013504	0.000824	0.000000	0.000000	0.000000	0.046602
SW	0.033628	0.016799	0.000441	0.000000	0.000000	0.000000	0.050868
WSW	0.036275	0.027596	0.003266	0.000000	0.000000	0.000000	0.067137
WSW	0.040482	0.041748	0.010474	0.000677	0.000000	0.000000	0.093381
WNW	0.019417	0.032892	0.015828	0.004266	0.000353	0.000000	0.072756
NW	0.017358	0.017329	0.006502	0.000971	0.000000	0.000000	0.042160
NNW	0.022919	0.016152	0.001942	0.000118	0.000000	0.000000	0.041131
Total	0.623124	0.326567	0.043660	0.006297	0.000353	0.000000	1.000001

**Table A.10 - Joint Occurrence Frequencies of Wind Direction Sector
by Wind Speed Category for the 18m Level Central Climatology Tower, 2006**

Sector	Wind Speed Category, meters/sec						Total
	0-2	2-4	4-6	6-8	8-12	>12	
N	0.02684	0.01426	0.00157	0.00000	0.00000	0.00000	0.04268
NNE	0.02998	0.02486	0.00280	0.00003	0.00000	0.00000	0.05767
NE	0.02701	0.03065	0.00189	0.00003	0.00000	0.00000	0.05959
ENE	0.02777	0.03709	0.00640	0.00032	0.00000	0.00000	0.07158
E	0.03159	0.03030	0.00413	0.00018	0.00000	0.00000	0.06620
ESE	0.02847	0.02940	0.00166	0.00000	0.00000	0.00000	0.05953
SE	0.02588	0.02442	0.00128	0.00000	0.00000	0.00000	0.05158
SSE	0.03176	0.03784	0.00338	0.00047	0.00006	0.00000	0.07350
S	0.03371	0.02865	0.00332	0.00041	0.00003	0.00000	0.06611
SSW	0.02655	0.02437	0.00233	0.00006	0.00000	0.00000	0.05330
SW	0.02454	0.03284	0.00544	0.00018	0.00000	0.00000	0.06300
WSW	0.02265	0.04081	0.01418	0.00323	0.00003	0.00000	0.08090
WSW	0.01933	0.04192	0.02079	0.00742	0.00154	0.00000	0.09100
WNW	0.01613	0.02463	0.01587	0.00844	0.00349	0.00003	0.06858
NW	0.02250	0.01808	0.00606	0.00140	0.00012	0.00000	0.04815
NNW	0.02568	0.01706	0.00364	0.00026	0.00000	0.00000	0.04664
Total	0.42038	0.45718	0.09473	0.02242	0.00527	0.00003	1.00000

**Table A.11 - Joint Occurrence Frequencies of Wind Direction Sector
by Wind Speed Category for the 36m Level Central Climatology Tower, 2006**

Sector	Wind Speed Category, meters/sec						Total
	0-2	2-4	4-6	6-8	8-12	>12	
N	0.009705	0.025165	0.006123	0.000949	0.000000	0.000000	0.041942
NNE	0.007837	0.036615	0.008756	0.000980	0.000000	0.000000	0.054188
NE	0.011021	0.045249	0.007776	0.000337	0.000031	0.000000	0.064414
ENE	0.011205	0.049871	0.016624	0.001867	0.000061	0.000000	0.079628
E	0.010317	0.039156	0.008909	0.000765	0.000000	0.000000	0.059147
ESE	0.009154	0.036523	0.005021	0.000092	0.000000	0.000000	0.050790
SE	0.008940	0.032452	0.004255	0.000031	0.000000	0.000000	0.045678
SSE	0.008848	0.051127	0.009521	0.000765	0.000031	0.000000	0.070292
S	0.010164	0.051892	0.008970	0.000735	0.000031	0.000000	0.071792
SSW	0.011695	0.040748	0.005480	0.000765	0.000031	0.000000	0.058719
SW	0.010685	0.043136	0.013195	0.001470	0.000122	0.000000	0.068608
WSW	0.009980	0.047545	0.021798	0.007654	0.001010	0.000000	0.087987
WSW	0.009735	0.045432	0.026084	0.008817	0.002694	0.000000	0.092762
WNW	0.010868	0.029360	0.018430	0.008419	0.003551	0.000031	0.070659
NW	0.013011	0.023022	0.007684	0.002296	0.000337	0.000000	0.046350
NNW	0.011756	0.019410	0.005266	0.000582	0.000031	0.000000	0.037045
Total	0.164921	0.616703	0.173892	0.036524	0.007930	0.000031	1.000001

**Table A.12 - Joint Occurrence Frequencies of Wind Direction Sector
by Wind Speed Category for the 61m Level Central Climatology Tower, 2006**

Sector	Wind Speed Category, meters/sec						Total
	0-2	2-4	4-6	6-8	8-12	>12	
N	0.00294	0.01835	0.01223	0.00259	0.00024	0.00000	0.03634
NNE	0.00294	0.01835	0.02047	0.00365	0.00035	0.00000	0.04575
NE	0.00294	0.02211	0.02058	0.00400	0.00012	0.00000	0.04975
ENE	0.00294	0.02658	0.02305	0.00953	0.00035	0.00000	0.06246
E	0.00329	0.01953	0.02070	0.00271	0.00035	0.00000	0.04658
ESE	0.00294	0.01117	0.01294	0.00012	0.00000	0.00000	0.02717
SE	0.00259	0.01129	0.01706	0.00094	0.00000	0.00000	0.03188
SSE	0.00318	0.01823	0.02811	0.00459	0.00012	0.00000	0.05422
S	0.00459	0.02494	0.03905	0.00553	0.00012	0.00000	0.07422
SSW	0.00365	0.02658	0.02811	0.00576	0.00012	0.00000	0.06422
SW	0.00353	0.02070	0.05622	0.01517	0.00188	0.00000	0.09751
WSW	0.00635	0.02623	0.06293	0.03117	0.00741	0.00000	0.13409
WSW	0.00612	0.02752	0.04987	0.02188	0.00600	0.00012	0.11150
WNW	0.00718	0.01988	0.02917	0.01294	0.00929	0.00012	0.07857
NW	0.00694	0.02200	0.01741	0.00388	0.00165	0.00000	0.05187
NNW	0.00376	0.01823	0.01023	0.00129	0.00035	0.00000	0.03388
Total	0.06587	0.33169	0.44813	0.12573	0.02835	0.00024	1.00000

Table A.13 - Joint Occurrence Frequencies of Wind Direction Sector by Wind Speed Category for the 61m Level Central Climatology Tower, Winter 2006

Sector	Wind Speed Category, meters/sec						Total
	0-2	2-4	4-6	6-8	8-12	>12	
N	0.00383	0.01254	0.00812	0.00139	0.00046	0.00000	0.02635
NNE	0.00325	0.01219	0.01787	0.00313	0.00046	0.00000	0.03691
NE	0.00325	0.02078	0.02472	0.00197	0.00000	0.00000	0.05072
ENE	0.00395	0.01834	0.03377	0.00429	0.00000	0.00000	0.06035
E	0.00371	0.00963	0.01114	0.00151	0.00000	0.00000	0.02600
ESE	0.00395	0.00975	0.00789	0.00070	0.00000	0.00000	0.02228
SE	0.00302	0.00824	0.01938	0.00151	0.00000	0.00000	0.03215
SSE	0.00313	0.01579	0.03145	0.00650	0.00302	0.00000	0.05989
S	0.00418	0.02194	0.04027	0.00743	0.00163	0.00000	0.07544
SSW	0.00696	0.02820	0.04480	0.00395	0.00023	0.00000	0.08415
SW	0.00604	0.03227	0.04004	0.00615	0.00046	0.00000	0.08496
WSW	0.00499	0.02704	0.05710	0.01683	0.00650	0.00012	0.11258
WSW	0.00499	0.02530	0.05455	0.03250	0.01474	0.00023	0.13231
WNW	0.00708	0.02112	0.03714	0.02008	0.01172	0.00116	0.09831
NW	0.00685	0.02797	0.01903	0.00453	0.00035	0.00000	0.05873
NNW	0.00522	0.02310	0.00917	0.00116	0.00023	0.00000	0.03888
Total	0.07440	0.31418	0.45648	0.11363	0.03981	0.00151	1.00000

Table A.14 - Joint Occurrence Frequencies of Wind Direction Sector by Wind Speed Category for the 61m Level Central Climatology Tower, Spring 2006

Sector	Wind Speed Category, meters/sec						Total
	0-2	2-4	4-6	6-8	8-12	>12	
N	0.00294	0.01835	0.01223	0.00259	0.00024	0.00000	0.03634
NNE	0.00294	0.01835	0.02047	0.00365	0.00035	0.00000	0.04575
NE	0.00294	0.02211	0.02058	0.00400	0.00012	0.00000	0.04975
ENE	0.00294	0.02658	0.02305	0.00953	0.00035	0.00000	0.06246
E	0.00329	0.01953	0.02070	0.00271	0.00035	0.00000	0.04658
ESE	0.00294	0.01117	0.01294	0.00012	0.00000	0.00000	0.02717
SE	0.00259	0.01129	0.01706	0.00094	0.00000	0.00000	0.03188
SSE	0.00318	0.01823	0.02811	0.00459	0.00012	0.00000	0.05422
S	0.00459	0.02494	0.03905	0.00553	0.00012	0.00000	0.07422
SSW	0.00365	0.02658	0.02811	0.00576	0.00012	0.00000	0.06422
SW	0.00353	0.02070	0.05622	0.01517	0.00188	0.00000	0.09751
WSW	0.00635	0.02623	0.06293	0.03117	0.00741	0.00000	0.13409
WSW	0.00612	0.02752	0.04987	0.02188	0.00600	0.00012	0.11150
WNW	0.00718	0.01988	0.02917	0.01294	0.00929	0.00012	0.07857
NW	0.00694	0.02200	0.01741	0.00388	0.00165	0.00000	0.05187
NNW	0.00376	0.01823	0.01023	0.00129	0.00035	0.00000	0.03388
Total	0.06587	0.33169	0.44813	0.12573	0.02835	0.00024	1.00000

Table A.15 - Joint Occurrence Frequencies of Wind Direction Sector by Wind Speed Category for the 61m Level Central Climatology Tower, Summer 2006

Sector	Wind Speed Category, meters/sec						Total
	0-2	2-4	4-6	6-8	8-12	>12	
N	0.003784	0.011924	0.009402	0.000803	0.000229	0.000000	0.026142
NNE	0.003554	0.021325	0.022013	0.003440	0.000000	0.000000	0.050332
NE	0.004586	0.032332	0.031529	0.001376	0.000229	0.000000	0.070052
ENE	0.006306	0.029466	0.013529	0.003210	0.001834	0.000000	0.054345
E	0.003440	0.030039	0.013414	0.001949	0.000000	0.000000	0.048842
ESE	0.004930	0.029007	0.014446	0.000803	0.000000	0.000000	0.049186
SE	0.007567	0.028663	0.016625	0.000917	0.000000	0.000000	0.053772
SSE	0.009631	0.040014	0.047352	0.002866	0.000344	0.000000	0.100207
S	0.008714	0.048727	0.059161	0.002522	0.000115	0.000000	0.119239
SSW	0.012039	0.052396	0.030498	0.001376	0.000229	0.000000	0.096538
SW	0.009287	0.052855	0.026714	0.001605	0.000115	0.000000	0.090576
WSW	0.009745	0.053199	0.026370	0.004242	0.000000	0.000000	0.093556
WSW	0.006306	0.041046	0.021784	0.001949	0.000229	0.000000	0.071314
WNW	0.004815	0.019147	0.009860	0.002408	0.000573	0.000000	0.036803
NW	0.008255	0.010663	0.002064	0.000115	0.000229	0.000000	0.021326
NNW	0.004930	0.008943	0.003669	0.000229	0.000000	0.000000	0.017771
Total	0.107889	0.509746	0.348430	0.029810	0.004126	0.000000	1.000001

Table A.16 - Joint Occurrence Frequencies of Wind Direction Sector by Wind Speed Category for the 61m Level Central Climatology Tower, Fall 2006

Sector	Wind Speed Category, meters/sec						Total
	0-2	2-4	4-6	6-8	8-12	>12	
N	0.005673	0.024347	0.023165	0.005319	0.001182	0.000000	0.059686
NNE	0.004609	0.027065	0.026947	0.006855	0.000709	0.000000	0.066185
NE	0.004609	0.036402	0.035220	0.007328	0.000236	0.000000	0.083795
ENE	0.005555	0.035811	0.057085	0.005909	0.000000	0.000000	0.104360
E	0.005555	0.034866	0.039357	0.001064	0.000000	0.000000	0.080842
ESE	0.004728	0.028838	0.024347	0.001182	0.000000	0.000000	0.059095
SE	0.004018	0.023638	0.019974	0.002246	0.000000	0.000000	0.049876
SSE	0.005437	0.019856	0.023401	0.003073	0.000946	0.000000	0.052713
S	0.003900	0.015601	0.019383	0.002246	0.000473	0.000000	0.041603
SSW	0.003191	0.016192	0.016310	0.001418	0.000118	0.000000	0.037229
SW	0.001655	0.012292	0.015365	0.000827	0.000118	0.000000	0.030257
WSW	0.003073	0.018083	0.018556	0.005791	0.001891	0.000000	0.047394
WSW	0.004846	0.034629	0.037348	0.013946	0.002482	0.000000	0.093251
WNW	0.004964	0.031202	0.027420	0.013119	0.004137	0.000000	0.080842
NW	0.010164	0.032738	0.014419	0.002600	0.000118	0.000000	0.060039
NNW	0.006973	0.028956	0.012883	0.003782	0.000236	0.000000	0.052830
Total	0.078950	0.420516	0.411180	0.076705	0.012646	0.000000	1.000000